THE REPUBLIC OF KOREA'S CORONAVIRUS DISEASE PANDEMIC RESPONSE AND HEALTH SYSTEM PREPAREDNESS

SEPTEMBER 2021

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Abbreviations

CDSCH	–	Central Disaster and Safety Countermeasure Headquarters
CSO	–	civil society organization
COVAX	–	COVID-19 Vaccines Global Access Facility
COVID-19	–	coronavirus disease
EDRM	–	Health-Emergency and Disaster Risk Management
EIS	–	epidemic intelligence service
EUA	–	emergency use authorization
GAVI	–	Global Alliance for Vaccines and Immunizations
GDP	–	gross domestic product
ICU	–	intensive care unit
KCDC	–	Korea Centers for Disease Control and Prevention
KCSC	–	Korea Communications Standards Commission
KDCA	–	Korea Disease Control and Prevention Agency
LGBTQ	–	lesbian, gay, bisexual, transgender, and queer
LMICs	–	low- and middle-income countries
LTC	–	long-term care
MERS	–	Middle East respiratory syndrome
MOHW	–	Ministry of Health and Welfare
NHIS	–	National Health Insurance Service
OECD	–	Organisation for Economic Co-operation and Development
PPE	–	personal protective equipment
PPP	–	public-private partnership
PRC	–	People's Republic of China
ROK	–	Republic of Korea
RT-PCR	–	reverse transcription polymerase chain reaction
WHO	–	World Health Organization

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Executive Summary

The Republic of Korea (ROK) was once the second highest in the world for the number of daily confirmed cases of the coronavirus disease (COVID-19), but the country was able to quickly suppress the surge and reduce the number of confirmed cases. As a result, the ROK's response in the early phase of the COVID-19 pandemic has been heralded as one of the most successful examples of COVID-19 control. Compared to countries in Europe and North America, both the size of the outbreak and the death toll have been relatively small. With this early success in COVID-19 control in the country, this report focuses on the ROK's medical and public health response, rather than the bigger picture of the country's response that goes beyond the medical aspects. Through this report, the authors aim to examine the overall COVID-19 response of the ROK beyond the medical and public health response and to further examine the strengths and weaknesses of the Korean response in a more balanced approach.

The 2015 Middle East respiratory syndrome (MERS) experience is credited as having provided the template for the country's pandemic response; however, what remains to be explored is the mechanism by which the previous response contributed to the country's response to COVID-19. The MERS outbreak instigated subsequent reforms. Like many East Asian countries, the ROK suffered from outbreaks of severe acute respiratory syndrome or SARS in 2003, Asian bird flu or H1N1 in 2009, and MERS in 2015. In particular, the MERS outbreak gave an experience of going through a nationwide communicable disease disaster. The number of infections and deaths was not high from MERS, but the outbreak shocked Korean society by exposing loopholes in the Korean system of controlling infectious diseases, including its surveillance, hospital infection control, and risk communication. The government has redesigned and redeveloped disaster response governance in the post-MERS recovery process; changed laws and institutions related to the infection control system; reorganized the internal structure of the Korea Centers for Disease Control and Prevention (now Korea Disease Control and Prevention Agency [KDCA]); and conducted peacetime training in preparation for emerging infectious diseases.

A key aspect of the ROK's response to the COVID-19 pandemic was the process of testing, tracing, and treatment, commonly known as the "three T's." Thanks to their prior experience, the government and KDCA were able to strengthen monitoring at the point of entry, and secured manufacturing capacity for test kits and testing capacity nationwide as soon as the sequence for COVID-19 was revealed. Infectious disease hospitals were designated across the country; all patients were admitted to the negative pressure room in the beginning; and tracing and isolation were properly managed to prevent large-scale local transmission. However, the ROK's capacity was put to the test for the first time after hundreds of patients presented in Daegu, one of the major cities of the country. Still, despite confusion in the early stages, experts came up with new ways to conduct large-scale tests without cross-infection risks, establishing living treatment centers

where patients with mild symptoms can be isolated and monitored outside the hospital, as well as minimizing in-hospital infections—all significant differences from the MERS episode. In the COVID-19 response, the Prime Minister's office took charge of comprehensive disaster response governance, and also worked in various ways to coordinate different ministries and liaise between the central and local governments.

This report comprehensively covers several aspects that were crucial to the success of the ROK, such as effective resource mobilization, coordination, and timely social distancing management with good compliance and enhanced risk communication. The report also describes the proactive participation of civil society organizations and improved level of response by local governments. Moreover, the report evaluates the appropriateness of the Korean response in light of the seven principles of the Health Emergency and Disaster Risk Management (EDRM) framework presented by the World Health Organization. Finally, this report presents lessons that can be taken by other countries in Asia, especially low and middle-income countries (LMICs).

The authors recognize the shortcomings and potential room for improvement in the ROK's response to COVID-19. One aspect is in taking care of the vulnerable population, which presented ethical considerations in the middle of the pandemic. Also, due to the lack of public investment in public provision of health services, there were considerable difficulties in mobilizing hospital beds and intensive care unit beds. Moreover, while the whole-of-government approach has been observed in various sectors, including finance, education, and securing supplies, questions remained whether the country can sustain continuous and intensive coordination in a prolonged pandemic situation. In addition, compared to the strengthened capacity of the central government, local governments clearly demonstrated a shortage of human resources and supplies. Risk communication also identified areas that still needed improvement, such as excessive disclosure of information about the lesbian, gay, bisexual, transgender, and queer (LGBTQ) community, and excessive disclosure of movement lines.

Lessons that LMICs can learn from the ROK's response can be summarized in a few points. First, just as the ROK's painful experience from MERS greatly helped the current response, LMICs may be able to find improvements and take action even in a resource-limited situation by learning from the experience of COVID-19 and other diseases in the past and present. Second, it is crucial to take a whole-of-government approach in establishing infectious disease management governance and mechanisms. Such an approach also requires a robust legal and institutional basis for various aspects of a pandemic response. Third, people's rights to health services, such as having basic access to diagnosis and treatment regardless of their economic status, should be secured at all times. In this regard, the pursuit and investment in universal health coverage would be important for public access to testing and treatment, which would eventually help reduce health inequality arising from the epidemic. It would also be important to maintain essential health services with a robust primary health care system. Finally, social distancing requires strong trust between the government and citizens: earning credibility through policies based on scientific evidence and through transparent and timely communication. This is a substantial asset that effectively controls infectious diseases. Also, practicing effective social distancing measures requires a balanced approach between disease control measures (including social distancing and lockdown) and socioeconomic measures.

Our assessment for the ROK's response fits well with what the Health-EDRM framework suggests, for countries to adapt in its response to public health emergencies. Therefore, based on what has been reviewed in the ROK's response to the COVID-19 pandemic, it is advisable for countries to follow the Health-EDRM framework and its seven key principles in combating any public health emergency using a whole-of-society and multisector, multi-institution, multidisciplinary, and well-coordinated approach to make a resilient health system and society before the inevitable arrival of future pandemics.

I Introduction

Purpose

The purpose of this report is to identify the key factors for the successful response of the Republic of Korea (ROK) to the coronavirus disease (COVID-19) pandemic during the disease's early phase in the ROK, and to study how the country has performed in terms of comprehensive disaster risk management. Specifically, while this study takes a close look at how a previous outbreak response played a role in shaping the ROK's response and how its unique health system performed in the response, various aspects of the disaster response in the ROK are also presented and analyzed. The report assesses the ROK's COVID-19 response within the framework of the Health Emergency and Disaster Response and Management (EDRM) developed and propounded by the World Health Organization (WHO), as these principles laid out in the Health EDRM provide a fitting framework for such an assessment from the perspective of comprehensive disaster response, as opposed to health-focused views on the response. It is hoped that based on the lessons learned from the ROK's case, other developing member countries of the Asian Development Bank may prepare their response to COVID-19 along with other disease and disaster risks.

Format of the Report

Descriptions of the project and methodology are provided in sections 1 and 2. The remainder of the report is organized as follows: section 3 lays out the country background, while section 4 describes the status of disaster and disease response governance in the ROK, as represented and tested by the MERS outbreak of 2015. In section 5, we elaborate on the implementation of the new and improved measures in the COVID-19 outbreak of 2020. In section 6, we discuss the takeaways from the ideation and operationalization of COVID-19 response measures from the perspective of the Health-EDRM framework. Finally, we discuss the validity of these points in application to other Asian Development Bank member countries in section 7.

The main methodology of the report comprises two parts, desk (literature) review of documents and semi-structured interview. Based on these, we review the overall response process and successful measures of controlling COVID-19 in the ROK. Against the Health-EDRM framework, an analytical approach is used for a comprehensive assessment of the ROK's success in the early phase of its COVID-19 response.

Literature Review

The secondary documents refer to government documents and policy briefs from the Ministry of Health and Welfare, Korea Disease Control and Prevention Agency, Ministry of Economy and Finance, and Ministry of Food and Drug Safety. Publications from academic journals are also reviewed.

Semi-structured Interview

The semi-structured interview is complementary to the desk review. Since COVID-19 is an ongoing issue, some important aspects of the country's response are not yet documented. Therefore, a series of interviews with key stakeholders will enrich our understanding of the situation. The structure of the interview was prepared in advance based on the framework of the report. Interviewees included government officials, academia, private sector, medical providers, civil society, and other stakeholders.

The Health-EDRM is an integrated framework to minimize the health impact on the population of risks from disasters. It helps countries and communities to be prepared with prevention measures, enough responding capacity, and resilient health and social care system. The Health-EDRM framework poses seven principles on which policies and strategies should be based: (i) risk-based; (ii) comprehensive in terms of management; (iii) applicable to all hazards; (iv) inclusive, people-centered, and community-centered; (v) multisector and multidisciplinary; (vi) whole-of-health system-based; and (vii) ethical.

The analysis provides the policies and responses that the country should continue and improve and lists takeaway messages for developing countries with a limited resource setting.

Background

Country Context

Geography and Demographics

The ROK is in East Asia, occupying the southern part of the Korean peninsula. The Korean peninsula is surrounded by seas to the east and west, while sharing the border with the Democratic People's Republic of Korea to the north. The country has a population of 51.8 million (July 2020 estimate). Compared to countries of the Organisation for Economic Co-operation and Development (OECD), the Korean population is relatively young. The proportion of the population over 65 is just 15.92% in 2020. However, the population is ageing very fast; by 2050, the ROK is projected to have the largest over-65 population in the OECD, with 38% of people aged 65 years or over. The ROK is a highly urbanized country with 81.4% of the total population (as of 2020) living in urban areas—9.9 million in the capital Seoul, 3.5 million in Busan, 2.8 million in Incheon, 2.2 million in Daegu, 1.5 million in Daejeon, and 1.5 million in Gwangju.

Economy

The ROK has achieved significant success in rapid economic growth and poverty reduction. Gross domestic product (GDP) grew 7.3% annually between 1960 and 2019. As a result, the gross national income per capita increased from \$67 in the 1950s to over \$30,000 in 2018. Annual export growth recorded 16.2% annually between 1961 and 2018, while both savings and investment rose to above 30% of GDP. In November 2009, the ROK became the first former aid recipient country to become a member of the OECD Development Assistance Committee.

Health System

Health Financing

The ROK spends about 8.0% of its GDP on health, comparable to the average of OECD countries (8.8% in 2018). The country finances its revenues from multiple sources, including national health insurance contribution (41.9%), government's tax subsidy for the National Health Insurance Service (NHIS) (16.6%), and out-of-pocket and private health insurance (33.7%). The primary payment mechanism for providers is fee-for-service in both outpatient and inpatient services. A payment

reform toward diagnosis-related groups in the 2010s ended up with only seven disease groups, while other disease groups remain under fee-for-service. The payment mechanism for long-term care (LTC) hospitals is per diem.

A majority of the citizens are covered by the NHIS, with a contribution of 6.67% of payroll. About 3% of the population is covered by the Medical Aid system whereby most of the essential cost is warranted by the government. Patients pay 10%–20% of the total health care cost as copayment or coinsurance, depending on age and type of services. Documented foreign workers and their families staying longer than 6 months are supposed to join the NHIS while undocumented foreign workers are not eligible.

Health Infrastructure

The number of hospital beds per population is 75.99 per million, which is one of the highest among OECD countries. Some 90% of the hospitals and clinics are not-for-profit, privately owned organizations. The density of the health care providers is lower than the OECD average. The number of practicing workforce per population is 2.39 per thousand for physicians and 7.24 per thousand for nurses.

Most health care organizations utilize electronic medical records, making automated claims for the NHIS efficient. All the diagnoses, tests, and prescription data are stored in the NHIS. Based on the centrally stored prescription data, a drug prescription monitoring system called Drug Utilization Review is in place. The review gives pop-up warning messages to the providers when there are drug–drug interactions from multiple organizations. However, sharing patient data between organizations has not been introduced yet due to both technical and data protection issues.

Infectious Disease Management and Response System

The main mechanism of the government's infectious disease management and response came through the erstwhile Korea Centers for Disease Control and Prevention (KCDC), which recently gained an upgraded independent status and has been reinstated as the Korea Disease Control and Prevention Agency (KDCA). This specialized agency is under the Ministry of Health and Welfare (MOHW) and undertakes the technical function of prevention and control of communicable and noncommunicable diseases in the country. For infectious diseases, the agency's key area lies in the investigation of transmission, quarantine, laboratory testing, and operation of research activities to support policy development regarding disease control. KCDC oversees two functional organizations, Korea National Research Institute of Health, which is the national laboratory body; and national quarantine stations, which include 13 quarantine stations across the country. The Korea National Research Institute of Health and national quarantine stations still function under the supervision of the KDCA (Figure 1).

Before becoming reinstated as KDCA, KCDC's history was strongly related to some of the infectious disease outbreaks in the ROK's history. The formal establishment of KCDC in 2004 followed the global severe acute respiratory syndrome epidemic, when the country's coordinated response

Figure 1: Organogram of the Korea Disease Control and Prevention Agency

Note: Data as of 30 January 2021.

Source: M. D. Oh et al. 2018. Middle East Respiratory Syndrome: What We Learned from the 2015 Outbreak in the Republic of Korea. *Korean Journal of Internal Medicine*. 33. pp. 233–246. <https://doi.org/10.3904/kjim.2018.031>.

resulted in having no severe acute respiratory syndrome case in the country. The government had established KCDC under MOHW as the main agency in charge of tasks related to disease control and prevention. After the 2009 global outbreak of H1N1 influenza, KCDC's function was enhanced in many aspects, when the H1N1 outbreak stretched the capacities and resources of the KCDC during the outbreak response despite the availability of vaccines and treatments. KCDC supported about 100 health care facilities through isolated outpatient care areas and heightened infection control capacity. KCDC also provided financial support to 30 designated hospitals to establish designated isolation unit wards with intensive care capacity to treat patients infected with highly pathogenic infectious diseases, and to increase airborne infection isolation room capacity. Quarantine stations were enhanced with infectious disease isolation care structures and were equipped with on-site laboratory testing capacity as well. KCDC went through another major organizational expansion after the MERS outbreak in 2015 with a new division for the functions of emergency operations, crisis communication, risk assessment, and international cooperation. Many of these organizational reforms were already fully in place when COVID-19 dawned upon the world and were crucial for the ROK's response to COVID-19.

IV

The Middle East Respiratory Syndrome Outbreak and Subsequent Reforms

The ROK has been exposed to several natural, social disasters, and infectious disease outbreaks. Infectious diseases, notably MERS in 2015, caused anxiety and confusion to the public but also had a significant impact on the nationwide perception of emergency preparedness. This triggered the reinforcing and strengthening of the country's disaster and emergency governance system.

The MERS outbreak infected 186 nations and led to the death of 38 people and 16,693 quarantined individuals. The late diagnosis and response of MOHW, its failure in super-spreader control, poor emergency communication, and inadequate hospital infection management system left MOHW subject to heavy criticism. As the severity of MERS in the country was significantly higher than that of other affected countries, the outbreak clearly revealed the country's weakness in public health emergency preparedness. Since then, the government has prioritized strengthening infectious disease governance systems. A detailed report on the specific response and resulting impact is provided in Box 1.

Box 1: The Middle East Respiratory Syndrome Experience of the Republic of Korea

The Republic of Korea (ROK) experienced the largest Middle East respiratory syndrome (MERS) outbreak outside of the Middle East region. With no previous importation of such a highly pathogenic disease in the country, the ROK suffered heavily. The outbreak started on 4 May 2015, with a single case of a patient who arrived in the ROK from Bahrain. The case was eventually confirmed in Samsung Hospital on 20 May, but multiple secondary infection cases arose from the patient's visits to several different local clinics and hospitals for about 10 days prior to admission at Samsung Hospital. The initial epidemiological investigation of the Korea Center for Disease Control and Prevention (KCDC) suggested that the outbreak was under control with only a small number of secondary infections from the index case.

However, one patient checked in at Samsung Hospital's emergency room and ended up infecting 82 others, resulting in a greater scale of the outbreak. Initially, according to KCDC's guideline, close contact was only defined as the person who had been in direct contact with a confirmed or suspected case, or someone who has been within 2 meters from the patient with manifested symptoms. With this guideline, although the patient was present at the same hospital as the index case, he was not subject to epidemiological investigation; only patients who were in the same patient room with the index case patient were quarantined along with medical personnel who provided care.

The outbreak quickly escalated with more confirmed cases found in different hospitals. The government convened the MERS Infection Crisis Management Countermeasure Committee on 28 May 2015 and completely reorganized its national governance structure for MERS response. Also, the Korean Society for Preventive Medicine cooperated closely with the government, establishing epidemiologic investigation support units at the local governments level. Subsequent MERS control activities were focused on hospitals, as the MERS outbreak had the characteristic of spreading through hospitals.

continued on next page.

Box 1 *continued*

Within 6 months, the outbreak was slowly placed under control. In total, the ROK suffered 186 laboratory-confirmed cases (185 in the ROK and 1 in the People's Republic of China); 38 deaths; with 16,000 quarantined by the end of outbreak—the largest outbreak of MERS to ever occur outside the Middle East region.

Sources: Korean Society of Infectious Disease. 2017. *White Paper on Chronicles of MERS*. Seoul: Korean Society of Infectious Disease; Government of the Republic of Korea, Ministry of Health and Welfare. 2016. *The 2015 MERS Outbreak in the Republic of Korea: Learning from MERS*. Seoul: Korea Institute for Health and Social Affairs.

The MERS infection was a new type of disease and public health authorities as well as local clinics and hospitals were not familiar with its characteristics. Although the country had done quite well in responding to the severe acute respiratory syndrome outbreak in the early 2000s, MERS, in stark contrast, had a severe impact on the Korean government and society. In the wake of the MERS outbreak that devastated the country, the government went through extensive restructuring of the country's infectious disease response system to prepare the country for unknown imported infectious diseases. This was done together with organizational change and human resource strengthening, with institutional and regulatory change such as introduction of special legislation and an overarching support to the overall health emergency response governance.

There were three aspects of inadequate response to MERS that gave the country invaluable lessons for the future: the importance of preparedness, information sharing, and early detection and action. As to the importance of preparedness, MERS highlighted a crucial weakness in capacity for field epidemiologic investigation, when the country had only about 34 epidemic intelligence service (EIS) officers and eventually had to fill the remaining needs with civilian and contract-based officers. As to information sharing, monitoring of global situations of infectious disease in real time and sharing disease-related information with international partners have been identified as a priority. Finally, as to early detection and early action, intensified screening at point of entry and keeping buffer capacity in local clinics and hospitals for early diagnosis were key lessons to prevent super-spreader events. Early detection and timely isolation, as well as an aggressive approach for quarantine activities upon mass exposure to threat in health care settings, were all highlighted.¹ Further details on these lessons from MERS are presented in Table 1.

¹ M. D. Oh et al. 2018. Middle East Respiratory Syndrome: What We Learned from the 2015 Outbreak in the Republic of Korea. *Korea Disease Control and Prevention Agency*. 33. pp. 233–246. <https://doi.org/10.3904/kjim.2018.031>.

Table 1: Lessons Learned from Middle East Respiratory Syndrome Outbreak of 2015

Category	Lessons
Preparedness	<ul style="list-style-type: none"> • Better monitoring of global situations of emergence and re-emergence of infectious diseases in real time • The need for increasing both the number and individual capacity of EIS officers <ul style="list-style-type: none"> ◦ At the onset of the MERS outbreak, the ROK only had about 34 EIS officers, which was far from the World Health Organization's recommendation of 1 per 200,000 population. This was highlighted as one of the weakest aspects of the ROK's disease control and response capacity. Eventually the number increased to 120 EIS officers by the end of 2019 and to 200 by the onset of COVID-19.
Information Sharing	<ul style="list-style-type: none"> • Sharing disease-related information with international partners • The Korea Center for Disease Control and Prevention (now Korea Disease Control and Prevention Agency) established a new Division of Risk Assessment and International Cooperation, which analyzes incoming risk and fosters information sharing on the occurrences or outbreaks of infectious diseases from other countries
Early Activities	<ul style="list-style-type: none"> • Intensified screening at the point of entry at the airport using equipment such as thermal scanners • Deploying doctors to local clinics and hospitals for identification of disease • Preventing super-spreading, which can happen in health care settings such as hospital wards and emergency departments. <ul style="list-style-type: none"> ◦ Early detection and timely isolation are crucial, as well as an aggressive approach for quarantine activities when many people are exposed to threat in health care settings.

COVID-19 = coronavirus disease, EIS = epidemic intelligence service, MERS = Middle East respiratory syndrome, ROK = Republic of Korea.
Source: M. D. Oh. et al. 2018. Middle East Respiratory Syndrome: What We Learned from the 2015 Outbreak in the Republic of Korea. *Korean Journal of Internal Medicine*. 33. pp. 233–246. <https://doi.org/10.3904/kjim.2018.031>.

Disaster Management Reforms

A well-arranged coordination system among different sectors with well-specified roles and responsibilities is essential. Moreover, beyond sector collaboration, securing coordination and collaboration between public and private sectors is also crucial. Multisector collaboration was enhanced after the MERS experience especially through the whole-of-government approach to infectious disease response to the COVID-19 situation.

The *Disaster Management Working-level Manual for Infectious Diseases* stipulates the government's risk management goal, governance system, risk alert system, and roles of ministries and agencies during an infectious disease outbreak. It is based on the Framework Act on the Management of Disasters and Safety, Article 34-5. After the MERS outbreak, this manual went through some changes, as shown in Table 2.

Table 2: Revised Response System According to Alert Level

Alert Level	Before MERS	After MERS
LEVEL 1 (ATTENTION) – Prevalence of an infectious disease in foreign countries	– Situation monitoring – Border quarantine measures – Prevention education and campaign (KCDC)	– Situation monitoring – Border quarantine measures – Prevention education and campaign (KCDC)
LEVEL 2 (CAUTION) – Emergence of an infectious diseases in the country – Nosocomial infection	<div>Central Infection Response Task Force</div> – At the level of CAUTION, both the Central Accident Response Headquarters and the Central Disaster and Safety Countermeasure Headquarters are operated	<div>Response Task Force (KCDC)</div> <div>Government-Wide Meeting (presided by the Prime Minister)</div> <div> <div>Management Task Force (Ministry of Health and Welfare)</div> <div>Support Task Force (Ministry of Public Safety and Security)</div> </div>
LEVEL 3 (ALERT/EMERGENCY) – Community transmission		
LEVEL 4 (CRITICAL) – Spread throughout the country	<div>Central Disaster and Safety Countermeasure Headquarters (Prime Minister or Ministry of Public Safety and Security)</div> <div>Central Accident Response Headquarters (Ministry of Health and Welfare)</div> – The two headquarters are activated when the Prime Minister deems it necessary, or upon the suggestion of the Minister of Public Safety and Security	<div>Central Disaster and Safety Countermeasure Headquarters (supervised by the Prime Minister, and supported by the Ministry of Public Safety and Security)</div> <div>Central Accident Response Headquarters (Ministry of Health and Welfare)</div> <div>Response Task Force (KCDC)</div>

KCDC = Korea Centers for Disease Control and Prevention; MERS = Middle East respiratory syndrome.

Source: Government of the Republic of Korea, Ministry of Health and Welfare. 2019. *Disaster Management Working-level Manual for Infectious Diseases*. Sejong.

The two major differences are (i) the director of KCDC performs infection response at all alert levels; and (ii) the Prime Minister, Minister of Health and Welfare, and the Minister of Public Safety and Security support KCDC's infection response from the "Caution" level. The manual also detailed the ROK's infectious disease alert system and countermeasure activities (see Table 3). These reforms were crucial in the ROK's response to COVID-19, paving the way for an effective whole-of-government approach for COVID-19. Although the Health-EDRM framework was not yet established at the time, the guiding principles of the framework are well reflected in the country's legislative reforms.

Table 3: Infectious Disease Risk Alert System and Countermeasure Activities

Level	Type of Threat		Major Activities Undertaken as Response Measures
	Novel Infectious Disease Emerging Overseas	Unknown/Reemerging Domestic Infectious Disease	
Level 1	Novel infectious disease emerges overseas, and becomes an epidemic.	Unknown/reemerging of domestic infectious disease	<ul style="list-style-type: none"> Countermeasures teams at KCDC initiate operations to tackle each infectious disease. Monitoring and surveillance for potential health risk takes place. Response capacity is prepared. If needed, measures for on-site measures are implemented, and related infrastructure can be deployed.
Level 2	Novel infectious disease enters ROK.	Limited transmission of the unknown/reemerging domestic infectious disease	<ul style="list-style-type: none"> Central Disease Control Headquarters is formed at KCDC and put into operation. Cooperation mechanisms for relevant agencies are activated. Relevant measures are installed and related infrastructures are activated. Monitoring and surveillance activities are strengthened.
Level 3	Limited transmission is detected for the novel infectious disease in ROK.	Community transmission of unknown/reemerging domestic infectious disease	<ul style="list-style-type: none"> Central Disease Control Headquarters of KCDC continues its operation. Central Disaster Management Headquarters is established at the Ministry of Health and Welfare. If needed, the Prime Minister holds a pan-governmental meeting. The Ministry of the Interior and Safety reviews for operation of pan-governmental support headquarters. Cooperation mechanisms for relevant agencies are strengthened. Disease prevention and surveillance activities are enhanced.
Level 4	Community transmission or nationwide spread is observed for the novel infectious disease in ROK.	Nationwide spread of unknown/reemerging domestic infectious disease	<ul style="list-style-type: none"> Full-capacity and pan-governmental response is in place. If needed, Central Disaster and Safety Countermeasure Headquarters begins its operation.

KCDC = Korea Centers for Disease Control and Prevention, ROK = Republic of Korea.

Source: Korea Institute for Health and Social Affairs. 2020. *Assessment on COVID-19 Response, Analysis and Evaluation*. Seoul.

Reform of the Korea Centers for Disease Control and Prevention and Other Institutional Changes

The ROK's comprehensive infectious disease management system is largely based on the legal and procedural revision after the MERS outbreak. According to the ROK's infectious disease management system, three main headquarters play key roles, as shown in Table 2. The reform of KCDC as well as other institutional changes later proved be critical in the ROK's effective response to COVID-19 pandemic, allowing better outcomes compared to the country's response to MERS in 2015.

Based on some of the lessons from the 2015 MERS outbreak, KCDC went through a major organizational expansion and reorganization, and the capacity of the KCDC has been considerably strengthened. In 2018, new departments such as emergency operations, crisis communication,

risk assessment, and international cooperation were established. In May 2020, the status of KCDC was elevated with expanded capacity in research as well as policy. The head will be at the rank of deputy minister in government, and the agency will have autonomy in personnel and budget without the need for MOHW approval.

One aspect of the significant enhancement efforts of KCDC was the expansion of its EIS program, which saw a growth from 34 EIS officers 2015 to 124 EIS officers in 2018. The number of EIS officers in the national KCDC headquarters was increased from 14 EIS officers in 2015 to 68 EIS officers in 2018. The impact of these increased capacity on the COVID-19 outbreak is shown in section 5C.

Also, an emergency operations center was established under the Center for Public Health Emergency Preparedness and Response, to collect and analyze domestic and international infectious disease information in real time. Through a control room that runs 24 hours a day, 7 days a week, the emergency operations center expands the emergency operations capacity of the Center for Public Health Emergency Preparedness and Response by detecting emergency situations at an early phase and sending an emergency reaction team for early response.

Some of the additional approaches were to establish a service system for early diagnosis, timely and effective quarantine, and qualified and specialized medical treatment. Furthermore, the government required the provision of selective care at emergency rooms to reduce hospital infection, expansion of hospitals' infection prevention and treatment system infrastructure, and improvement of basic medical care environments such as reducing hospital patient room size.

Moreover, as part of institution-level changes, a newly developed emergency use authorization (EUA) protocol was introduced in 2017 to approve newly developed diagnostic kits for commercial use. The protocol could be initiated only in a situation of a large infectious disease outbreak, and if such time came, it was specifically indicated in the protocol that EUA can be initiated upon the decision of the KCDC director general. Also, during the time of the MERS epidemic, legislative changes were made in the Infectious Disease Control and Prevention Act and the Personal Information Protection Act so that at the time of a widespread infectious disease outbreak, mobile phone use data with location information and credit card usage log data could be accessed, along with accessibility to closed circuit television images, to facilitate the process of contact tracing at the time of epidemiologic investigation of confirmed patients of an infectious disease.

Reform on Risk Communication

One of the important lessons learned from the ROK's experience with MERS was the role of risk communication in managing infectious diseases. During the initial stage of the MERS outbreak, inaccurate information regarding criteria for testing was spread through broadcast media and online. There was a big argument against disclosing medical institutions where patients with MERS had visited. Also, the one-voice principle was not followed well in the communication between the central and local governments. Consequently, the government's poor responses to the MERS outbreak caused confusion and increased the level of distrust and anxiety among the citizens. Therefore, since the outbreak of MERS in the ROK, the government has made several efforts to improve the risk communication system.

The Infectious Disease Control and Prevention Act was amended on 6 July 2015, which strengthened the accessibility and right of the public to obtain information about infectious disease outbreaks and infection prevention and control. Also, the law ensures the prompt disclosure to the public of the routes of confirmed cases, their transportation means, their close contacts, the history of health care institution visits, and so on (see Table 4).

The Office of Communication was established for public health communication and effective risk communication in case of emergency from an infectious disease outbreak.² To enhance global infectious disease risk assessment and better international cooperation, the Division of Risk Assessment and International Cooperation was established as well, whose role is to collect and

Table 4: Three Main Headquarters of the Infectious Disease Management System in the Republic of Korea

Central Disaster and Safety Countermeasure Headquarters	Comprehensive management of the prevention, response, and restoration of large-scale disasters <ul style="list-style-type: none"> • Establishment of disaster preparedness plan such as prevention and emergency response • Comprehensive management of the information related to disaster signs and situation • Proposal for the review of the declaration of disasters and special disaster areas • Coordinate the response activities at the disaster sites • Request for administrative and budget, dispatch of employees, and other necessary support
Central Accident Response Headquarters	Comprehensive management of the infectious disease outbreak situation <ul style="list-style-type: none"> • Issue risk alerts and disseminate • Comprehensive management and adjustment of the overall accident response and response to media • Legal and institutional revision for the effective disaster response • Request for cooperation with related organizations and dissemination of the situation • Support for the damaged nation • Establishment of infectious disease response plan and update government-wide response system • Support Central Disease Control Headquarters
Central Disease Control Headquarters	Comprehensive management of the epidemic prevention <ul style="list-style-type: none"> • Operate emergency response team • Support relevant organization and set an information sharing system • Comprehensive management of damages by infectious disease • Operate internal risk assessment meeting and advisory committee • Develop response guideline • Operate immediate response team and infectious disease monitoring system • Manage entrants and diagnostic test system • Coordinate local government response team • Overall management of epidemiological investigations and manage patients and contacts • Support and manage prevention supplies • Information gathering and dissemination • Risk communication to the public

Source: Government of the Republic of Korea, Ministry of Health and Welfare. 2019. *Infectious Disease Disaster Risk Management Standard Manual*. Seoul.

² The key roles of risk communication officers are as follows: direct and supervise crisis management communication activities in an integrated manner; internally coordinate to enable the related internal departments to communicate in a unified voice; attend meetings on infectious disease emergencies to share information and judge and confirm the level of external information disclosure; implement swift and timely response activities through briefings, etc.; and oversee whether the risk and/or crisis communication is being implemented according to the standard operating procedure.

Table 5: Risk Communication-Related Amended Law

Article 6 (Duties and Rights of Citizens)	Each citizen shall have the right to know information on the situation of the outbreak of infectious diseases and the prevention and control of infectious diseases and how to cope therewith, and the State and local governments shall promptly disclose the relevant information (Amended on 6 July 2015)
Article 34-2 (Disclosure of Information during Infectious Disease Emergency)	<p>(1) Where the spread of an infectious disease harmful to citizens' health results in the issuance of a crisis alert of the caution level or higher prescribed in Article 38 (2) of the Framework Act on the Management of Disasters and Safety, the Minister of Health and Welfare shall promptly disclose information with which citizens are required to be acquainted for preventing the infectious disease, such as the movement paths, transportation means, medical treatment institutions, and contacts of patients of the infectious disease, by posting such information on the information and communications network, distributing a press release, etc. (Amended by Act No. 17067, 4 March 2020)</p> <p>(2) Where any information disclosed under paragraph (1) falls under any of the following subparagraphs, the relevant person may file an objection with the Minister of Health and Welfare, in writing, orally, or using the information and communications network. (Newly Inserted by Act No. 17067, 4 March 2020)</p> <ul style="list-style-type: none"> • Where any disclosed information is different from the actual fact; • Where he/she has any opinion on any disclosed information. <p>(3) Where the Minister of Health and Welfare deems that the objection raised under paragraph (2) is well-grounded, he/she shall take necessary measures, such as correcting the relevant disclosed information (Newly Inserted by Act No. 17067, 4 March 2020)</p> <p>(4) Matters necessary for the scope of, procedures, methods, etc. for disclosing information and raising objections prescribed in paragraphs (1) and (2) shall be prescribed by Ordinance of the Ministry of Health and Welfare (Amended by Act No. 17067, 4 March 2020; Newly Inserted by Act No. 13992, 6 July 2015).</p>

Source: Korea Institute for Health and Social Affairs. 2020. *The First Analysis and Evaluation of the COVID-19 Response*. Sejong.

assess global infectious disease outbreaks, and to plan and manage international collaboration with foreign governments and international organizations in the event of a global infectious disease outbreak.

The KCDC published the *Standard Operating Procedure for Risk Communication in Case of Public Health Emergencies* in 2017, which was revised in 2018 (Table 3). The manual states specific tasks for communicating risks, with the objective of securing public trust, building a correct risk-coping environment, and clarifying the collective strategy by level of risk alerts (see Table 4).

Later in its response to COVID-19, the ROK's risk communication was heralded as one of the best examples of open, transparent, and effective health communication in the world. The director general of KCDC (now KDCA) was credited to be the prime figure in the government's risk communication efforts, who successfully earned a high level of trust from the public. The reforms in the risk communication process in managing infectious disease outbreak situations indeed played a key role, allowing prompt yet accurate, open, and transparent communication regarding the COVID-19 situation in the country.

Table 6: Communication Strategy by Level of Alerts

Alert Level	Risky Situation	Communication Direction	
		Goal	Strategy
Level 1 Blue (Attention)	<ul style="list-style-type: none"> – An EID is prevalent abroad (Not yet entered ROK) – Occurrence of a patient with infection of unknown cause in ROK 	Correct Awareness concerning the Situation	Delivery of swift, accurate, and transparent information on the infectious disease situation
Level 2 Yellow (Caution)	<ul style="list-style-type: none"> – The foreign EID has entered ROK: occurrence of a patient in Korea – Emerging and reemerging infectious disease occurs in ROK (The patient with a disease of unknown cause has been confirmed as having an infectious disease) 	Compliance with Prevention Rules	Active public communication through various channels
Level 3 Orange (Emergency)	<ul style="list-style-type: none"> – Foreign EID or domestic EID/ reemerging infectious disease spreads to other regions 	Empathy in overcoming the risky situation	Encouraging voluntary participation of the public to overcome the risky situation
Level 4 Red (Critical)	<ul style="list-style-type: none"> – Foreign EID or domestic EID/ reemerging infectious disease occurs in many regions. There is a sign of nationwide diffusion. 		

EID = emerging infectious disease, ROK = Republic of Korea.

Source: Korea Centers for Disease Control and Prevention. 2018. *Standard Operating Procedure for Risk Communication in Case of Public Health Emergencies*. 2nd ed. Osong.

Case Description

Overall Transmission Dynamics

Case and Outbreak Identification

The first case of COVID-19 in the ROK was recorded on 20 January 2020, a Chinese national who had recently traveled from the province of Hubei, People's Republic of China (PRC). Shortly after, on 24 January, the second case was identified, this time a Korean passport holder. The sixth case was identified on 30 January as the first indigenous case, where the patient had not travelled to any other country. Among the first 30 cases, 1 was domestic (indigenous) and 19 foreign, including travelers from the PRC, Japan, Singapore, and Thailand.

On 18 February, the biggest outbreak of the country (as of November 2020) that began as the 31st case of COVID-19 was identified in Daegu, the fourth most populous metropolitan city of the ROK, home to 2.2 million. Close contacts of the 31st case were particularly clustered around a nationwide religious group known as Shincheonji. By 8 March, 4,482 positive cases were identified from the religious group, forming the majority of the then total case count of 7,478.

From then, there was a quick decline in the number of domestic infections, meaning that the imported case was once again the majority. Apart from the aforementioned Daegu outbreak in March, there were two notable domestic outbreaks: one occasion linked to an Itaewon nightclub in Seoul on 2 May; and a considerably larger outbreak on 15 August linked to political protests in Gwanghwamun, Seoul. Although these two outbreaks did not result in a surge of cases as sharp as the Daegu outbreak, these were notable events for the timeline in terms of their impact on subsequent intervention rollouts and public controversies around privacy and compliance.

A summary of daily infection trends is shown in Figure 2, while the trend in the number of testing is shown in Figure 3. While the infection trends show the impact of the three outbreaks in varying magnitudes, there is a uniformity of surge testing apparent in three spikes of the graph, each following the outbreaks of Daegu, Itaewon nightclub, and Gwanghwamun political protest, in chronological order.

Rollout of Interventions

The government took interventions in quick response to the transmission dynamics. One of the first notable changes was border policy. While the border has remained open throughout the course of the entire timeline to date, a special immigration procedure was introduced for travelers from Hubei

Figure 2: Daily Number of People Tested and Confirmed Cases in the Republic of Korea

Source: Government of the Republic of Korea, Ministry of Health and Welfare. 2020. *Updates on COVID-19 in Republic of Korea*. Press release. 24 November 2020. http://ncov.mohw.go.kr/en/tcmBoardList.do?brdId=12&brdGubun=125_____.

Figure 3: Daily Confirmed Coronavirus Disease Cases and Deaths in the Republic of Korea; Japan; and Taipei, China

Source: Johns Hopkins University CSSE COVID-19 Data – Last updated 20 January 2021. Retrieved from ourworldindata.org.

(27 January) and later extended to the PRC (4 February). This form of special immigration program was incrementally extended and applied to travelers from Hong Kong, China and Macau, China (12 February); Japan (9 March); Italy and Iran (12 March); Europe (16 March); and eventually, travelers from elsewhere (19 March). In addition, a mandatory quarantine period of 14 days has been in place since 1 April 2020.

Another notable intervention featuring the government's responsiveness was in its testing capacity for COVID-19. The timeline for increasing testing capacity is shown in Figure 2. Two responsive interventions—border control and extensive testing—proved effective in the country's influx of exogenous cases of COVID-19.

Following the domestic outbreaks, central and local governments set new policies on daily social distancing. On 29 February, new social distancing measures were introduced and were held until the decreased infection trends meant a relaxed measure would be applied from 6 May. From then, the government changed the alert levels according to daily infection rates, which also implied varying distancing measures taking place accordingly. The timeline of these specific interventions is compared with the alert levels and infection trends in Figure 4.

Figure 4: Alert Levels, Infection Trends, and Interventions in the Republic of Korea

Source: Y. Son. 2020. *National Policy on COVID-19 Response and Current Status*. Paper presented during the First Webinar on COVID-19 for Policy and Technology Sharing, 13 May.
<https://www.mofa.go.kr/viewer/skin/doc.html?fn=20200527122421688.pdf&rs=/viewer/result/202104>.

Disaster Response Governance System and the Central Disaster and Safety Countermeasure Headquarters

COVID-19 is considered a serious public health emergency in the ROK, and the situation is being managed as a national disaster response case, triggering the disaster response governance mechanism. Following the 2015 MERS outbreak, the *Disaster Management Working-level Manual for Infectious Diseases* was revised.³ According to the manual, the infectious disease response system operates on different alert levels. At Level 1, countermeasures teams are organized at KCDC. The Central Disease Control Headquarters at KCDC is formed and operated at Level 2; while the Central Disaster Management Headquarters is formed and supports the Central Disease Control Headquarters at Level 3. At the highest level (Level 4), the Central Disaster and Safety Countermeasure Headquarters (CDSCH) is activated.

The central role of CDSCH is to undertake the policy dialogue and decision-making for major policies such as social distancing, inter-ministerial coordination, and facilitation of discussion between central and local governments. The organizational structure is presented in Figure 5. At the center of this structure is the head (currently the Prime Minister), while the deputy head is the minister of Interior and Safety. Under CDSCH's supervision are the Central Disease Control Headquarters and Central Disaster Management Headquarters, the National Fire Agency, and the Coast Guard, which can directly dispatch and undertake response missions, as well as other ministries and agencies. Each of the ministries and agencies sometimes operates local units and organizations directly, or through working relationship channels with local government counterparts.

Because CDSCH is a non-standing body, a COVID-19 operation center was established under the Prime Minister's office to support the Prime Minister's role as the head of CDSCH (Figure 6). This COVID-19 operation center prepares CDSCH meetings, coordinates between ministries, and communicates directly with the Office of National Security or with the President. As seen in Figure 6, the COVID-19 operation center lies within the Prime Minister's office and is subdivided into teams: the General Affairs Team, which takes care of CDSCH meetings and risk communication; the Supporting Team, which provides daily operational support to the Prime Minister; and the Current Issue Management Team, which deals with current issues such as vaccine rollout and maintains relationship with medical communities.

Daily meetings are one of the core activities of CDSCH. This meeting begins at 8 a.m., either online or offline, with members of the CDSCH as well as 17 local government heads, while 226 other member local authorities attend as listeners. The Prime Minister first gives a brief report on the status of the outbreak, and the directions for government response. Then, a closed-door meeting is run in order to discuss social distancing and other important response decisions, so that the government as a whole can operate under a coherent policy. The meeting also discusses how to implement the policy through collaboration between departments and central-local governments. The local governments use this channel to report to the central government and cooperate both ways.

³ The *Disaster Management Working-level Manual for Infectious Diseases* stipulates the government's risk management goal, governance system, risk alert system, roles of ministries, and agencies on infectious disease outbreak based on the Framework Act on the Management of Disasters and Safety, Article 34-5.

Figure 5: Overview of the Republic of Korea's Infectious Disease Management System

Source: Government of the Republic of Korea, Ministry of Health and Welfare. 2019. *Disaster Management Working-level Manual for Infectious Diseases*. Sejong.

Figure 6: Prime Minister's Office COVID-19 Operation Center

Source: Government of the Republic of Korea, Authors, based on the interview material provided by the Prime Minister's office.

Effect of the Restructuring of the Central Disaster and Safety Countermeasure

The restructured CDSCH is regarded as having positively affected the country's COVID-19 response in the following three aspects:

First, CDSCH distributed responsibilities over multiple parties. Decision-making under pressing situations is a heavy burden for any single government authority, as it can be subject to heavy audits; therefore, timely and bold decisions cannot be made if few individuals are held responsible. CDSCH's structure differs from other settings in this regard in that all decisions are made collectively through a communal meeting, so political responsibilities are effectively distributed, allowing for better decisions to be made without compromising individual freedom.

Second, having the Prime Minister head the CDSCH helped achieve the whole-of-government approach in practice. Previously, in 2014, after the Sewol ferry incidents,⁴ the government revised the Disaster Safety Law and restructured the disaster governance structure so that the Prime Minister can take over as the head of CDSCH. Before this restructuring, the minister of Interior and Safety were to assume the charge of CDSCH, who does not oversee the minister of Finance (deputy prime minister of economy), minister of Education (deputy prime minister of society and culture), and fellow ministers of other ministries. COVID-19 marked the first case situation where the Prime Minister actually headed the CDSCH, allowing this disease response to be truly a whole-of-government approach. This decision was made at the meeting for pan-government COVID-19 countermeasures, chaired by the President, as it was also decided to raise the disaster response level (infectious disease risk alert) to Level 4. The decision was based on the fact that multiple ministries were to be coordinated, and it has become finally possible for all the relevant ministries to work at a high level of coordination for an effective multisector COVID-19 outbreak response under the Prime Minister.

Third, CDSCH served as a pivotal communication channel between the central and local governments. This collaboration was particularly effective as all work activities were preceded by a daily meeting whereby important policy information were discussed and transferred. This reduced a lot of administrative friction, and local authorities could quickly communicate the troubles around the implementation of the policy at hand, allowing the central government to revise accordingly.

Box 2 presents case studies of these responses.

⁴ In 2014, the sinking of the Sewol Ferry caused 304 deaths including around 250 high school students. Many problems in the government disaster governance surfaced, such as the lack of a proper control tower and the lack of interdepartment cooperation in terms of the whole-of-government approach.

Box 2: Examples of Disaster Response Governance to the Coronavirus Disease

Case Study A: The Prime Minister as the Head of the Central Disaster and Safety Countermeasure

In February 2020, Daegu experienced a surge in the number of patients following a mass outbreak within the Shincheonji religious group. At the time, there was not too many coronavirus disease (COVID-19) targeted beds or isolation beds available. Experts observed that a large proportion of the patients were young and without major symptoms nor intensive treatment requirements. Therefore, the demand surge could be effectively managed, while keeping isolation standards, through a novel concept called residential treatment centers, which utilizes private dormitories and workshop venues with the supervision of a minimal number of health workers.

The problem was that there were no legal grounds to admit patients to such locations, under the current medical laws. Without legislative changes, it was difficult for anyone to step up and guide or implement such a policy. After 3 days, the Prime Minister left the capital, set up the headquarters in Daegu, and made the bold decision to open residential treatment centers. This would not have been possible had it not been the Prime Minister who chaired the Central Disaster and Safety Countermeasure.

Case Study B: The Whole-of-Government Approach in the COVID-19 Vaccination Efforts

COVID-19 vaccination requires an intricate operation procedure that includes the production, distribution, delivery, as well as monitoring post-treatment. The government designated the head of the Korea Disease Control and Prevention Agency to promote the vaccination process and set up a group of experts to be in charge. In particular, the country's army officer was designated the head of vaccine transport, allowing military support for the task. Upon distribution to the local authorities, the vaccine is then transported through the vaccination promotion team to the local public health clinics, which offer the dose or send them to other health institutions.

Source: Interview by the authors.

Testing and Tracing

Screening and Testing Strategy

The basic approach of the ROK for testing was to make the test available as fast as possible, as widely as possible, while having the test affordable as well. This was possible through fast initiation of test kit development by KCDC, and by having the test available at 18 public health laboratories. Wider availability was also possible through the very fast approval of commercial testing kit and making testing available through designated hospitals and private laboratories throughout the country. For this process, institutional preparedness in having EUA was very important, as well as close communication and collaboration with private laboratory diagnostics manufacturers and academia (specifically the Korean Society of Laboratory Medicine). Timely availability of testing kits was found to be crucial during the MERS outbreak in 2015. The delay in testing and confirming of MERS patients, and tests initially not being readily available, were aggravated by delays in transfers to local laboratories.⁵ The country had learned from that experience and ensured early patient detection through screening clinics and diagnostic testing capacities during the COVID-19 outbreak.

⁵ Government of the Republic of Korea, Ministry of Health and Welfare. 2015. The 2015 MERS Outbreak in the Republic of Korea: Learning from MERS. Sejong. https://www.mohw.go.kr/react/jb/sjb030301vw.jsp?PAR_MENU_ID=03&MENU_ID=032903&CONT_SEQ=337407&page=1 (accessed 7 October 2020).

Development of Coronavirus Disease Testing Method

From the very beginning, KCDC's focus was to develop the testing kit for COVID-19 at the shortest time possible. However, with no known information available about COVID-19, the first approach by KCDC was to use a pan-coronavirus testing method, which was to test for all known coronaviruses to confirm that the infection was not from previously known types of coronaviruses. However, as soon as the Chinese Center for Disease Control and Prevention released the genetic sequencing data of COVID-19, KCDC began developing laboratory testing methods in partnership with the Korean Society of Laboratory Medicine. The COVID-19-specific real-time reverse transcription polymerase chain reaction (RT-PCR) test became available on 26 January 2020. Soon, KCDC began transferring the testing method to 18 city and provincial public health laboratories, which began the service of testing for COVID-19 patients.⁶

On 27 January, KCDC held an emergency meeting with various laboratory diagnostics manufacturers, together with the Korean Society of Laboratory Medicine, to have RT-PCR testing kits manufactured by private manufacturers, in order to have the testing kit commercially available. To expedite approval of the test kit, KCDC decided to operate an EUA in coordination with the Ministry of Food and Drug Safety. Through this process, one commercial COVID-19 RT-PCR testing kit became available, and private hospitals and commercial laboratories were able to perform RT-PCR testing.

Figure 7 describes the stages of laboratory testing method development and dissemination for "Disease X."

By the end of May 2020, 7 test kits were available and eventually, the ROK was able to establish a total of 146 testing institutions throughout the country, including 13 national quarantine stations and 113 testing institutions at private hospitals and commercial laboratories. This allowed a daily RT-PCR testing capacity of an average of 15,000 up to 20,000 tests per day, with a turnaround time of 6–24 hours from screening to receiving the result. With this capacity, the country was able to register a total of 668,492 tests by 11 May 2020 (see Figure 8). Private diagnostic manufacturers, private hospitals, and commercial laboratories all contributed to scaling up. Also, while majority of testing was done at private hospitals and commercial laboratories, KCDC took on the role of quality assurance over these private laboratory facilities.

⁶ KCDC. 2020. Initiation of the Development of Novel COVID-19 Testing Method. https://www.cdc.go.kr/board/board.es?mid=&bid=0015&act=view&list_no=365729&tag=&nPage=6 (accessed 15 October 2020).

Figure 7: Stages of Laboratory Testing Method Development and Dissemination

KCDC = Korea Centers for Disease Control and Prevention, EUA = emergency use authorization, RT-PCR = reverse transcription polymerase chain reaction, SARS = severe acute respiratory syndrome.

Source: HS Lee. 2020. *The COVID-19 Situation and Response Measures of Korea*. Presentation for the Webinar on Learning from Korea's Digital Response to COVID-19. 13 May. <https://olc.worldbank.org/content/learning-korea%E2%80%99s-digital-response-covid-19-russian>.

Figure 8: Increase in Laboratory Testing for Coronavirus Disease in the Republic of Korea

KCDC = Korea Centers for Disease Control and Prevention.

Source: Y. Son. 2020. *National Policy on COVID-19 Response and Current Status*. Paper presented during the First Webinar on COVID-19 for Policy and Technology Sharing. 13 May. <https://www.mofa.go.kr/viewer/skin/doc.html?fn=20200527122421688.pdf&rs=/viewer/result/202104>.

Improvement of Screening Process for Specimen Collection

With better availability of testing kits, the screening and specimen collection service became available on an even wider scale. COVID-19 screening and specimen collection, through nasal and throat swabs, were provided at 241 public health centers, city and provincial public hospitals, university hospitals, and some designated hospitals and health facilities. Eventually, the ROK had 599 screening stations throughout the country. This made COVID-19 screening readily available to work and residential areas, which made it very easy for people to get tested if necessary. This was additionally expedited using drive-through screening stations. At the peak of its operation, 48 of 599 COVID-19 screening stations were drive-through screening stations. With drive-through screening stations (see Figure 9), screening became faster and safer as well, as people were able to stay in the cars all throughout the screening and specimen collection process.⁷

Figure 9: Operation of Drive-Through Screening Station

Source: S. Lee. 2020. COVID-19 Case Study: The Use of ICT & AI to Flatten the Curve in the Republic of Korea. Paper presented during the AI for Global Good Summit. Webinar. 27 March. <https://aiforgood.itu.int/events/covid-19-case-study-the-use-of-ict-ai-to-flatten-the-curve-in-the-republic-of-korea>.

Strategy to Strengthen Disease Surveillance Capacity in Ports of Entry

(a) Strengthening of Screening and Quarantine in Points of Entry

One of the key priorities for the ROK's response to COVID-19 was to prevent the influx of COVID-19 cases from overseas. However, the Korean government decided to undertake this goal without closing the border whenever possible. Indeed, ROK never completely closed its border

⁷ J. Y. Kim et al. 2020. The First Case of 2019 Novel Coronavirus Pneumonia Imported into Korea from Wuhan, China: Implication for Infection Prevention and Control Measures. *Journal of Korean Medical Science*. 35 (5). e61. <https://doi.org/10.3346/jkms.2020.35.e61> (accessed 5 October 2020).

during the COVID-19 pandemic. However, as the COVID-19 global pandemic situation escalates, the ROK has taken various measures to step up screening and quarantine processes at points of entry. One of the first efforts was to prevent entry of travelers coming from Hubei province in the PRC; and later, travelers coming from other parts of the PRC, Italy, and Iran had to go through enhanced entry screening. Soon, travelers coming from all parts of the PRC had to go through a special immigration process, and this special immigration process was applied to travelers coming from Europe by 13 March. By 19 March, the process was applied to all passengers coming from any part of the world.

All travelers on or after April 1 must undergo temperature checks and fill out the quarantine form and the self-symptom checklist. Also, all incoming travelers were required to download the self-quarantine management app and self-symptom screening app, and report symptoms once a day for 14 days upon their arrival in the ROK. While general asymptomatic travelers are sent home for self-imposed quarantine procedures, incoming travelers exhibiting any COVID-19 symptom had to be tested at the quarantine center at that point of entry. If the traveler tests negative, he or she may go into self-quarantine for 14 days, but if the traveler tests positive, the person will be treated in a hospital or at a residential treatment center, depending on the severity of the symptoms.

The strengthening of screening and quarantine processes played out very well in part because the country has been already upgrading and intensifying the process of screening and quarantine since the MERS outbreak. The country has made a lot of efforts in improving the process since 2015, and one may say this could have contributed to managing the screening and quarantine process during the COVID-19 pandemic.

(b) Epidemic Investigation Strategy

The ROK's approach for contact tracing and epidemic investigation strategy was very much the standard process of epidemic investigation conducted by EIS officers, who were stationed at the ROK Disease Control and Prevention Headquarters and city and provincial health offices throughout the country. When there is any suspected or confirmed COVID-19 patient, EIS officers from the city or provincial health office would conduct the investigation, which may be conducted by EIS officers from KCDC headquarters as well. The process of investigation follows the standard process of investigation, risk assessment, contact classification, and contact management. In the process, it is important to identify the movement route of the patient and to check possible contact cases, tracing and finding them to prevent further transmission. With this system of epidemic investigation and personnel, it was possible to trace and isolate COVID-19 contact cases rapidly. This aggressive epidemic investigation and contact tracing approach was crucial in containing the spread of COVID-19. As seen in Figure 10, the painstakingly tenacious contact tracing for each and every one of all the suspected and confirmed COVID-19 cases was crucial in the ROK's response to the pandemic.

Figure 10: Contract Tracing Strategy—Stepwise Approach

(c) Use of Innovation and Technology for Contact Tracing and Enhancing Disease Surveillance Capacity in Points of Entry

Following the 2015 MERS outbreak, a SMART quarantine information system was introduced in 2017 in partnership between the government and one of the country's major telecom company, Korea Telecom. The system can detect and track anyone on roaming service traveling back to the ROK from any of the countries where a major infectious disease outbreak is ongoing. This was done by utilizing the overseas roaming data service system in partnership with mobile telecommunication service providers in the ROK. After its development and pilot introduction with Korea Telecom in 2016, KCDC entered into a partnership with SK Telecom and LG U+ Telecom, to cover all mobile phone subscribers in the ROK. With this system, information on incoming travelers with roaming service can be shared across the Ministry of Justice, the Ministry of Foreign Affairs, airline companies, and telecommunication companies. As for incoming travelers coming back from countries with ongoing infectious disease outbreaks, the information would be shared with KCDC, the National Health Insurance Corporation, the NHIS, and the Review and Assessment Service. In this way, doctors can also be notified of the countries that the patient has visited and can tell if the patient has visited countries with an ongoing outbreak of international concern. Doctors can inquire further about the possibility of infection and report to KCDC if they identify any suspected case of public health concern in the country.

The country's efficient use of technology in its COVID-19 response was largely due to the institutional and legal preparedness prior to the emergence of the disease, which, as stated before, was rather serendipitously built into the country following its experience with the largest outbreak of MERS

outside of the Middle East region in 2015. Specifically, EIS officers were able to access mobile phone use information with global positioning system location data and credit card transaction log data of the person subject to epidemic investigation, together with closed circuit television footage that can be available for epidemic investigation. This was possible because of legal changes to the laws such as Infectious Disease Control and Prevention Act and Personal Information Protection Act, which allowed access to mobile phone location information and credit card transaction log data in a situation of widespread epidemic of infectious disease outbreak of national concern. The legal change was made at the time of 2015 MERS outbreak as a part of the Korean government's effort to respond to the epidemic in 2015.

When COVID-19 began to escalate in Daegu and Gyeongbuk, the government introduced an additional system to enhance the process, the Epidemiological Investigation Support System. This system was developed by the Ministry of Land, Infrastructure and Transport in partnership with KCDC. With this system, the process analyzing the movement of confirmed cases was automated as well as management of access to mobile phone location information and credit card transaction log data. Also, the process of manually requesting and receiving the data was automated through a real-time information interchange process. This became possible by using the previously developed City Data Hub under the National Strategic Smart City Research and Development Program. This Epidemiological Investigation Support System shortened the duration of identifying movement information from 24 hours to less than 20 minutes, which made the contact tracing process much faster than before.

(d) Additional Factor in the Strength of Epidemic Investigation

There were various efforts to expand epidemic investigation capacity, including increasing the human resource size of the epidemic investigation team. Initially, there were 120 EIS officers and 10 emergency response teams, but later the number expanded to 200 EIS officers and 30 emergency response teams. During the time of large outbreak in Daegu and Gyeongbuk, there was additional deployment of public health doctors to serve as additional human resource to undertake the role of EIS officers.

However, there was an additional aspect that helped the process of the epidemic investigation and contact tracing, and this was involvement of public health personnel in 241 local public health centers, which are present in each district throughout the country. Even before the COVID-19 pandemic, there have been education and training personnel in all health centers in a program called frontline Field Epidemiology Training Program, which gave basic training on local infectious disease case management and epidemic investigation. As the need for epidemic investigation increased, the presence of basic public health personnel in the 241 public health centers to undertake the initial process of epidemic invitation was very helpful for the overall process of contact tracing.

(e) Communication of Occurrence of Confirmed Cases

New transmissions and occurrences of confirmed cases were readily shared with the public through local government websites and official emergency alert text messages. This was part of the government's effort to share the situation of the epidemic in an open and transparent manner, which was a key lesson learned from the 2015 MERS experience. Specifically, information on patient

movement was shared promptly so that people can check whether they were in the same place at the same time. A summary of the place and time details of the patient would be shared through the internet as well as through text message alerts. Furthermore, several third-party websites and apps have been developed to visualize the published information, such as location of confirmed cases. Local populations are hence aware of the local outbreak situation (see Figure 11).

However, there were privacy concerns regarding revelation of too much information. In response to the concerns, the government Anti-Corruption and Civil Rights Commission made changes to guidelines for the way information was collected and distributed. First, the extent of information sharing was adjusted to omit too specific information such as the name of the places concerned. Secondly, public release of information was limited to only the necessary cases; specifically, information on contact tracing was to be publicly released only when tracing is only partially complete so that the potential close contacts are not fully identified, in which case the public can self-identify using the publicized tracing information. The government body continues to consider privacy implications of the various measures in social distancing, including quick response or QR code technology and contact tracing alerts.

Figure 11: Sharing of Location and Movement Information of Confirmed Cases

Source: HS Lee. 2020. *The COVID-19 Situation and Response Measures of Korea*. Presentation for the Webinar on Learning from Korea's Digital Response to COVID-19. 13 May. <https://olc.worldbank.org/content/learning-korea%E2%80%99s-digital-response-covid-19-russian>.

Isolation and Treatment

(a) Isolation and Containment Strategy

Strict isolation and quarantine measures were vital for the ROK's approach to control COVID-19. Simultaneous efforts in widespread testing, contact tracing, and immediate isolating and quarantining of confirmed and suspected cases seemed to have been effective in blocking further transmission and preventing escalation. After a case is tested and contact-traced, there are various directions for isolation and quarantine measures. Confirmed patients will be admitted to a hospital or a residential treatment center through a triage based on severity. If the symptoms are severe, the patient will be admitted to a designated hospital where they will be receiving treatment in isolation; otherwise, the patient will be admitted to a residential treatment center and monitored with minimal treatment in isolation. On the other hand, if a close contact tests negative, the person can self-quarantine in a facility of choice, including his or her home.

In the process of managing self-quarantine cases, public health officers from local health centers managed the quarantine process and performed daily monitoring activities. To monitor the person in quarantine, the case officer made daily phone calls to check up on the status of the quarantined. To supplement quarantine management, mobile apps are used as well. There are two apps: one is for the person in quarantine to perform daily self-assessment of COVID-19 symptoms and to report symptoms status to the authority; the other is used by case officers to monitor people in quarantine for their daily symptom status and to check via global positioning system if the person registered is outside the bounds of the designated quarantine area.

(b) Treatment: Increased Accessibility Through Universal Coverage

In the ROK, universal coverage for treatment played a significant role in controlling the spread of COVID-19. The government made COVID-19 treatment free of charge for all Korean citizens as well as foreigners, based on the diplomatic principle of reciprocity.⁸ Anyone with a symptom could get a diagnostic test without financial concerns, which ensured, from the government's perspective, not only equity but also efficiency in locating patients.⁹ The NHIS, in the form of a pooled fund, provided a strong safety net for the less privileged population. Furthermore, patients received sickness benefits to make up for income loss.

(c) Development of Criteria Based on Patient Data

Initially, there existed clear criteria for hospital admission for COVID-19, but they turned out to be too strict and inefficient for the quickly accelerating scale of the outbreak. For instance, all patients were supposed to be isolated in hospital beds with negative pressure ventilation.

⁸ According to NHIS reports, a total of \$74 million was funded for hospital admission costs of COVID-19 until August 2020, from which 84.5% was funded by the NHIS and the rest by the local and central governments.

⁹ According to NHIS reports, a total of \$50 million was funded for testing administration costs of COVID-19 until August 2020, from which approximately \$20 million was funded by the government and \$30 million from the NHIS. \$1.2 million was spent for foreign patients, from which half was funded by the government and the other half by the NHIS.

As the number of patients surged in Daegu, the local government saw the hospital beds were quickly being occupied. At the same time, international evidence and clinical experience suggested that there was a significant disparity in clinical risk by population characteristics, including age and comorbidity. With the help of relevant experts, the local government identified the clinically meaningful risk factors and came up with a set of modified criteria, based on clinical data from the NHIS. As a result, EIS officers started to collect risk factors in the epidemiological investigation process and determined whether a patient should be admitted to hospital or residential treatment centers.¹⁰

(d) National Guidelines for Multiple Sectors

The KDCA published national guidelines for multiple sectors as early as January 2020. The guidelines initially focused on controlling the disease, sampling method, isolation, and so on. In February, the institution also distributed response guidelines for schools, health facilities, screening sites, and social welfare centers. Regarding treatment guidelines, medical societies played key roles. The Korean Society of Infectious Disease, for example, published the first clinical guideline for treating patients with COVID-19 as early as 4 March 2020. The society has developed and updated multiple guidelines for key players including the primary care sector, hemodialysis room, and local governments. Guidelines were distributed through their websites as well as MOHW and KDCA websites. Health professionals and societies frequently hosted and engaged in webinars, sharing up-to-date knowledge and experience in treating patients.¹¹

(e) Protecting the Elderly in Long-Term Care Facilities

Compared to other countries, the ROK had relative success in protecting vulnerable populations in LTC facilities. In the initial phase, a few of the LTC facilities fell victim to the virus and quickly grew as hotspots. In April, KDCA developed a guideline for LTC hospitals. The guideline required hospitals to introduce governance in each health facility, prevention measures, surveillance and daily reporting (to central authorities), and restriction on family visits. General patients were tested prior to admission to the LTC hospitals. Following the new guideline, the facilities saw no major outbreaks until October 2020, when a few hospitals saw multiple cases of COVID-19. Subsequently, KDCA initiated pooled testing on health care personnel at LTC facilities.

The other side of success, however, left plenty of room for improvement. As the restriction continued, long-term and strict control over family visits brought loneliness to the elders. Moreover, not all LTC facilities designated deathbeds for spending last hours with family, despite the cultural importance of gathering family members before the end of life. Although there were alternatives to physical limitations such as video calls, the face-to-face interactions were greatly missed during the final and unique moments of life (see Box 3).

¹⁰ Interview 2; see section 5B(v)(a) for the role of residential treatment centers for minimizing nosocomial infections.

¹¹ Under the scheme, there was close cooperation and communication between KDCA and academic societies through various government projects on MERS-related issues, creating an organic response in developing the guidelines.

Box 3: A Patient's Story from Confirmation to Recovery

Patient A is a citizen who returned to the Republic of Korea after staying abroad. According to his testimony, he received a simple check-up at the immigration office and had a slight breathing difficulty with fever at the time. He was examined at a walk-through inspection center outside the airport and moved to a government's temporary accommodation. The process took about 7 hours, and the patient was confirmed positive of coronavirus disease (COVID-19) early the following day.

Patients with mild symptoms were transferred to the life treatment center, but he had difficulty breathing and was taken to a public hospital in Gyeonggi province. He was initially in a room with two other patients but moved to a single room when his breathing difficulties worsened. There was nothing special about the daily routine except blood pressure and body temperature measurement three times a day. The doctor decided to discharge patient A when two consecutive tests were negative. After discharge, the local government was in charge of the patient. They provided transportation from the hospital to home, and the local health center routinely checked patient A's condition by phone and prohibited the patient from going out. Patient A mentioned that there was no mental support in the process.

Although it was a pretty embarrassing experience, he said he was satisfied with the overall management system of COVID-19 patients. Moreover, the total cost of hospitalization, more than \$10,000, was fully covered by the National Health Insurance Service without any user charge, so he was not burdened at all. When asked if there was any other issue, he wished to have more official information about the post-COVID-19 symptoms from the government or medical experts, as many people seek information on the social media, which is far less reliable.

Source: Interview by the author.

Resource Mobilization and Coordination

Managing Intensive Care Units and Bed Capacity

Following the utilization of testing capacity, the need for hospital beds, including intensive care unit (ICU) beds, surged accordingly. Nationally, there were 198 beds in negative pressure rooms and 337 isolation beds designated as public resources for controlling infectious diseases, called “nationally designated negative pressure isolation rooms,” monitored and managed by KDCA. The initial guideline for new and emerging infectious diseases recommended an isolation room for all patients regardless of clinical severity. Consequently, isolation rooms were filling up as quickly as the number of confirmed patients. A potential alternative idea was to convert other facilities with many individual rooms into isolation facilities for patients with minor symptoms, an idea that quickly spread among medical experts, advisory groups, and government officials.¹² However, both MOHW and the local government could not act on the idea without any legal backing. Instead, the Presidential office introduced residential treatment centers.¹³ This alternative scheme, following a shortage of hospital beds in Daegu, prevented excess mortality in the city and eventually the country.

¹² Interview 1 and 2.

¹³ Interview 2.

Designation of infectious disease specialty hospitals is another form of inpatient resource made available under the Infectious Disease Control Act, entirely dedicated to inpatient services for patients with mild to moderate symptoms. Between 23 February and 12 March 2020, the government designated up to 67 hospitals with 11,658 beds. As most infectious disease specialty hospitals were public and small institutions without sufficiently trained medical staff or devices for critical care, operationalization took a gradual process of emptying and restructuring hospital wards, training the corresponding medical staff, spacing the beds, and securing foot traffic. These hospitals received financial support for converting suitable areas and beds for caring patients with COVID-19. As a result, and thanks to the introduction of residential treatment centers, demand for beds never exceeded supply capacity except for a brief period in the early phase of the Daegu outbreak.

Securing hospital beds and ICU for severe patients, however, remained a challenge. The government, having fundamentally relied on private institutions through the NHIS, did not have a clear blueprint for public health care delivery. As a result, financial performance of the private sector had been driving the ratio between public and private hospitals. Back in the late 1970s, the ratio between public and private hospitals was 50:50; after the introduction of NHIS, health care demands and more utilization facilitated private investments. Now, beds in public hospitals account for only 10% of total available beds in the country. While this has the advantage of increased efficiency overall, this leaves the country open to difficulty in fully mobilizing beds during a crisis.

Indeed, private hospitals have multiple reasons for not welcoming mobilization of beds during a crisis. First, using ICU resources for COVID-19 requires exclusivity and specificity, limiting workforce and medical device availability for general wards. Secondly, there is a potential distrust between the government and hospitals, in this case on proper reimbursement for the mobilization of the beds. In the MERS outbreak, government compensation for the hospitals' revenue loss was significantly delayed, causing major fiscal challenges to private institutions. For example, the first compensation committee was held 5 months after the initial cases, and the actual payment took another 2 months. Thirdly, there is a potential stigma associated with the hospital's brand value when an infectious disease case is accepted in one of their beds. The public was reluctant to go to hospitals with a history of MERS patients, which brought additional revenue loss. Lastly, following in-hospital transmission of MERS in one of the largest private hospitals in the country, MOHW filed a lawsuit against the hospital, an ongoing case as of 2021.

These problems have recently been mitigated. Regarding compensation after hospitalization, the compensation committee for COVID-19 was launched on 17 February, only a month after the first case. Two months later, on April 9, the first compensation payment was delivered to 146 hospitals that suffered from either unused beds or a shutdown. This initial payment for each hospital varied greatly, ranging from \$100,000 to \$5 million. The second compensation in the following month focused on infectious disease specialty hospitals for unused beds and actual care-related costs, covering 66 hospitals with an average amount of \$1.8 million per hospital. It is regarded that timely compensation has been effective for building trust in the present, as well as for the potential mobilization of beds in the future.

The government introduced measures to manage hospital resources efficiently. Firstly, the government laid out a plan for flexible management of hospital beds. As of 2 April, only 40% of the beds in infectious disease specialty hospitals were empty, so the government lifted the designation from a third of those hospitals by the end of April, allowing them to go back to normal operations. Following another outbreak in September and October, the government redesignated some of these hospitals. Secondly, adjacent regions were clustered for improved efficiency of hospital beds. Seventeen provinces and metropolitan cities merged into six clusters for sharing information and transferring patients in case of bed shortage.

The remaining challenges as to governance include monitoring and coordinating the mobilized resources. As of now, responsibilities are partitioned into separate authorities: MOHW monitors available hospital beds and isolation capacities; KDCA and the local government monitor patients; and the National Emergency Medical Center coordinates patient transfers.¹⁴ The dispersion of responsibilities and authorities could hinder timely coordination and provision of appropriate treatment.

Mobility and Training Capacity of Human Resources

Mobilization of the public workforce proved to be an effective solution to workforce shortage, especially during the Daegu outbreak in February and March. There was a shortage of health care workers for obtaining samples in mass screening sites, while ICUs had a shortage of experienced doctors and nurses. Public health doctors were temporarily relocated to Daegu for relief, and more than 1,000 young doctors arrived and played a pivotal role amid critical shortages seen in the early stages.¹⁵ They took care of screening centers and isolation facilities (e.g., residential treatment centers), while more experienced doctors provided care for more severe patients in hospital settings. At the same time, local authorities called upon local hospitals to provide workforce support to designated hospitals.

Another noteworthy solution to workforce shortage came from volunteers. The head of the local doctors' association called for volunteer clinicians and nurses. More than hundreds joined and pulled the shifts during the critical periods. MOHW also recruited volunteer nurses in March. In September, MOHW announced a new training program for experienced nurses. The program aimed to augment and prepare nurses who were able to provide care in the ICU settings. More than 400 nurses received this training and were subsequently assigned to designated hospitals.

Maintaining Routine Operation of Essential Health Care Services

Maintaining routine essential care is a key requirement for reducing the burden of the disease in the long term. The overall relative success in the ROK's initial response meant that essential

¹⁴ The role of the local government in patient monitoring is as follows: the local government oversees local hospitals and their infection control, epidemiological investigation of the confirmed patients, support for residential treatment centers, and checking up on quarantined persons. The local government also supplies food and living supplies during quarantine and makes one or two phone calls and/or visits to ensure the compliance of the quarantined.

¹⁵ Men in 3-year public service as part of their conscription duties.

services have not been threatened much, except for a brief period in March, when several clinics and hospitals had to shut down for a few days, interrupting prescription for patients with chronic diseases. For critical diseases including heart attacks and strokes, the number of percutaneous coronary interventions and similar numbers for interventions on strokes in 2020 had decreased, compared to the same period in 2019, according to the NHIS.¹⁶ The number of hypertension and diabetes patients nominally increased, but after adjusting for the rate of natural increase, the numbers indicated a decrease of 0.2% for hypertension patients and 2.4% for those with diabetes. Data suggests that compared to other countries hit by COVID-19, the extent and magnitude of decrease in clinical utilization were not as substantial.

The government temporarily relaxed regulations on teleconsultation and video consultation using mobile apps to increase accessibility of care for chronic diseases. It should be noted, however, that this approach requires sufficiently well-designed services and tightly monitored regulations; otherwise, this approach can pose significant threats to primary health.

Medical Supplies

As a protective measure for the citizens, one of the hallmarks of the ROK's COVID-19 response was its mask wearing policy. Indeed, just as in many other countries in Asia and the Pacific, wearing a mask has already been culturally accepted and in common practice, especially during heightened air pollution levels during spring and autumn. The government made recommendations for wearing masks as part of one's self-protection practices as well as social distancing measures. Later, following the second wave in August, the government made wearing masks mandatory. As a result, mask wearing has been a universal practice in the country, and it has been emphasized as one of the best response measures at a time when there is neither a vaccine nor a highly effective treatment. As for protecting health care workers, there was an emphasis on infection prevention and control practice, and a strong focus on wearing personal protective equipment (PPE). KCDC has been producing official guidelines and manuals accordingly. Health care workers who treat COVID-19 patients wear PPE of level D protection capacity in the negative pressure rooms of designated hospitals. Also, health care workers who collect COVID-19 testing samples in sampling stations must also wear PPE.

Both the public and private sectors took part in the rapid mobilization of medical supplies. For example, the country experienced severe shortage and price surge of facial masks in the initial phase of the outbreak. The government intervened in markets and secured a public supply chain for masks, dubbed "public masks." The two distributors that competed for the public mask supply chain were government-commissioned and private. Domestic suppliers voluntarily joined a tender system through the government's official procurement system. In particular, the tenders included a clause for suppliers that 50%–80% of their total production should be distributed through the public supply chain. In return, a government subsidy was extended to suppliers to hire more workers, thereby increasing overall production capacity. Meanwhile, private-to-private partnerships also played a role in the distribution. When mask suppliers reached peak production, experienced engineers from larger companies were available for support, improving productivity in small mask firms.

¹⁶ NHIS. 2020. Changes in People's Medical Use Behavior Due to COVID-19. <https://www.nhis.or.kr/nhis/together/wbhaea01600m01.do?mode=view&articleNo=138736&article.offset=30&articleLimit=10>. 28 October.

Due to yellow dust and fine dust every year, wearing masks (both imported and locally produced) is already common practice. Nevertheless, the country suffered in February and March from a sharp surge in demand for masks. To facilitate the importation of masks and other PPE, the Korea Customs Services implemented measures including tariff reductions and quick custom clearance. In March, the number of imported masks was as high as 21 million units. Major exporters were the PRC (66%) and Viet Nam (22%), which supplied N95 masks, accounting for 65%; and surgical masks, accounting for 35%. Domestic production capacity also increased rapidly. As the imports faced fierce global competition, domestic companies started to ramp up production, rapidly increasing from 70 million units per week in February to 100 million units per week by May.¹⁷

Three strategies for mask provision ran simultaneously to monitor supply. First, production was monitored as the private firms reported daily production quantities and weekly forecasts. Secondly, sellers were regulated as they had to report quantities sold and were required to earn authorization for large-scale trades. Finally, there was a quota on export as a ratio of daily production, and this ratio was controlled by the Ministry of Economy and Finance. More recently, the Korean Food and Drug Administration has been monitoring and controlling the export quotas (Figure 12).

Regarding PPE, domestic companies exported fabrics and imported finished products from countries in Southeast Asia. In response to potential export restrictions in those countries, the government collaborated with local firms from the end of March to secure domestic production. The firms were able to sign long-term purchase contracts and “rotation contracts,” replacing expired products in governments’ stockpiles with new items regularly. KDCA has secured 7.72 million pieces of PPE in 12 months since March 2020.

¹⁷ The government formed a technical support organization for masks in March 2020, providing consulting services for nine companies with various needs for technical guidance. This allowed an increase in mask production by 306,000 in less than a month. The government also created a matching fund for production line innovation projects, leading to KRW7 billion funded to 44 production lines. This allowed an increase of 4.5 tons in terms of raw material used, and a production increase of 990,000 masks daily. See also Ministry of Industry. Support for Expanding Mask Production Through Field Technology Difficulties and Efficiency Improvement Projects. http://www.motie.go.kr/motie/gov3.0/gov_openinfo/sajun/bbs/bbsView.do?bbs_seq_n=162841&bbs_cd_n=81

There was no shortage of ventilators nor extracorporeal membrane oxygenation, thanks to the well-managed scale of the outbreak. The existing 10,000 ventilators and 350 oxygenation machines across the country were enough to handle all demand. According to the government, 300 additional ventilators and 100 oxygenation machines will be secured as stockpiles for national emergencies, and a pan-government support group will fund supply chain localization of 11 high-priority medical devices.

Social Distancing

Table 7 summarizes the changes in social distancing measures in the ROK in 2020. Overall, there was no well-defined social distancing scheme during the first wave in February. As the first wave peaked in March, the government enhanced its social distancing measures for April and May. When the number of confirmed cases stayed at the lowest level, the government refined the social distancing scheme for the first time and spelled out the plans according to each level. The scheme played a key role during the second wave. During the response, the need for a more detailed plan increased. When the level retreated to Level 1 in October, the government further refined the scheme and published the second amendment. The second amendment consists of five levels of social distancing with specific details for the scope of each level. One of the key changes was that the local government is given the authority to set a social distancing level. Not long after the amendment, the third wave began at the end of November. As situations in the metropolitan area and some regions became aggravated, both the central and local governments reacted by increasing the social distancing levels.

Table 7: Various Social Distancing Measures, 2020

Date	Situation	Measures
29 February	First wave in Daegu	Introduction of social distancing (Level 2)
2 March	Schools remained closed	Schools did not begin after winter vacation <ul style="list-style-type: none"> • Online education began on 9 April
22 March		Enhanced social distancing (Level 3) <ul style="list-style-type: none"> • Ease of social distancing measures on 20 April • Further downgraded to Level 1 on 6 May
20 May		School reopening for key years
May–August		Release of the first emergency disaster relief fund
28 June	Levels 1, 2, and 3	First amendment of social distancing scheme (three levels)
23 August	Second wave	“Level 2” social distancing across the country
30 August		<ul style="list-style-type: none"> • “Enhanced” Level 2 social distancing
14 September		<ul style="list-style-type: none"> • Downgraded back to Level 2 in Metropolitan Seoul
12 October		<ul style="list-style-type: none"> • “Level 1” social distancing across the country
October–December		Release of the second emergency disaster relief fund
7 November	Levels 1, 1.5, 2, 2.5, and 3 Regional authority given	Second amendment of social distancing scheme (five levels)
19 November	Third wave	“Level 1.5” in the metropolitan area and some regions
24 November		<ul style="list-style-type: none"> • Upgraded to Level 2 in the metropolitan area
8 December		<ul style="list-style-type: none"> • Level 2.5 in the metropolitan area and Level 2 elsewhere
4 January 2021		<ul style="list-style-type: none"> • Ban on private gatherings of more than 5 people

Source: Authors.

Regarding school closures, the government faced a number of difficult decisions. When the first wave broke out in February, a new academic year was about to begin, but every school was kept closed until March. The Ministry of Education directed schools to open virtually in April, and as the first wave subsided, the Ministry of Education let the schools partially open. Gradually, students were able to go to schools under strict infection control measures, including handwashing, indoor and outdoor mask-wearing, physical distancing, daily check for symptoms, and self-isolation for those with symptoms. As a result, the country did not face serious incidences of school-based infections. A study from KDCA shows that there was no increased risk of transmission of COVID-19 by attending school. Among the 127 confirmed adolescent cases from 1 May to 12 July, only 3 cases were attributed to public education and kindergartens; most cases were instead associated with family-related (59 cases) and private lesson-related (18 cases) incidences.¹⁸ In the second semester, starting from late August, more students were expected to attend school. However, only one-third to two-thirds of students were allowed to attend school at a time, where the exact scale was dependent on the level of social distancing. Many academics and experts in the country stressed the importance of a continuum of education and policy measures to minimize education disparity as well as to prevent domestic violence.

Restrictions on facilities with high infection risks were a crucial part of social distancing. All facilities were asked to maintain logbooks for visitors, check symptoms and temperatures at entrances, place hand sanitizers, deliver proper instructions to visitors, and disinfect venues regularly. Also, facilities such as restaurants, cafés, pubs, clubs, karaoke venues, and indoor concert and event halls were designated as facilities with a high risk of transmission. These facilities had to close before 9 p.m. or shut down entirely, depending on the level of social distancing. Some raised concerns over these restrictions, namely that the economic costs of social distancing were not equally imposed and left the self-employed vulnerable.¹⁹ The country further issued a ban on private gatherings of more than five people in December 2020, deeming it the highest level of restriction barring complete lockdowns.

The government arranged additional budget to emergency disaster relief funds for the self-employed, affected facilities, and low-income households. It is still questioned whether there has been enough compensation for those facilities and individuals.

Figure 13 illustrates the discretionary fiscal response to COVID-19 in high-income and middle-income countries. Even compared to countries like Germany, which usually takes a fairly conservative stance on fiscal policies, the ROK exhibits low levels of fiscal support compared to its GDP. The low compensation and fiscal support is attributed to the absence of a legal basis for compensation.²⁰ In January 2021, the President and the Prime Minister called for legislative changes for further compensation, but the Ministry of Economy and Finance have since expressed concerns around the levels of national debt.

¹⁸ E. Y. Kim et al. 2020. Children with COVID-19 After Reopening of Schools, South Korea. *Pediatric Infection & Vaccine*. 27 (3). According to the Ministry of Education, as of 10 December 2020, some 1,757 students and four teachers were confirmed positive irrespective of the source of infection.

¹⁹ The proportion of self-employed in the ROK is about 25%, ranking fifth among OECD countries.

²⁰ The legislation after MERS enabled timely compensation for hospitals' losses; however, there was no legal basis for the loss caused by social distancing measures.

Figure 13: Discretionary Fiscal Response to Coronavirus Disease in Selected Economies

AEs = advanced economies, ARG = Argentina, AUS = Australia, BEL = Belgium, BGR = Bulgaria, BRA = Brazil, CAN = Canada, CHL = Chile, COL = Colombia, CZE = Czech Republic, DEU = Germany, DNK = Denmark, EGY = Egypt, EMMIEs = emerging market and middle-income economies, ESP = Spain, FIN = Finland, GBR = United Kingdom, GEO = Georgia, IDN = Indonesia, IND = India, ITA = Italy, JPN = Japan, KAZ = Kazakhstan, KOR = Republic of Korea, MEX = Mexico, NZL = New Zealand, NLD = Netherlands, NOR = Norway, PAK = Pakistan, POL = Poland, PRC = People's Republic of China, ROU = Russia, SGP = Singapore, SWE = Sweden, THA = Thailand, TUR = Turkey, USA = United States of America, ZAF = South Africa.

Note: Values are percentages of 2020 gross domestic product.

Source: IMF. Database of Fiscal Policy Responses to COVID-19. <https://www.imf.org/en/Topics/imf-and-covid19/Fiscal-Policies-Database-in-Response-to-COVID-19> (accessed 13 February 2021).

Risk Communication

Since 30 January 2020, the government has been providing COVID-19 updates through press briefings twice a day, through the Central Disaster and Safety Countermeasure Headquarters in the morning, and the Central Disease Control Headquarters in the afternoon. The daily briefings are televised and streamed live on social media such as Facebook and YouTube. The current director of KDCA, Jung Eun-Kyung, leads the press briefings, providing extensive information including the number of confirmed cases, number of people currently in quarantine, number of tests performed, and routes of confirmed cases. Her statements can be characterized by evidence-based and straightforward wordings, effectively obliterating ambiguity; in addition, clarifications and corrections regarding fake news and misinformation are provided. Her coherent approach to the pandemic response is considered to have restored the public's trust in the government's response system.

The KCDC call center (1339) is an integral component to the ROK's risk communication strategy. The call center is open 24/7 to individuals and health care institutions, for any question relating to infectious diseases, health care institutions, availability of health care facility services, and even advice on appropriate behaviors during the pandemic. Furthermore, anyone can access KCDC's mobile app to receive information on confirmed cases with COVID-19, their travel history, close contacts, and so on. Also, mobile text alerts about real-time information on COVID-19 are sent to every phone in the regional network.

The Korea Communications Standards Commission (KCSC) has been handling and suppressing fake news and other types of misinformation surrounding COVID-19. KCSC reported in October that they had taken measures to stop 197 sources of fake news and misinformation detected in digital communities such as Naver (47 cases), YouTube, Facebook, DC Inside, and Ilbe. The content of these sources consists of various rumors and allegations on the government's response to COVID-19. For example, it is rumored that the government fabricates test results, increases the number of confirmed cases by compelling people to get tested, and prioritizes shipping face masks to the Democratic People's Republic of Korea despite insufficient domestic supply. The relevant legislation, however, barely exist and do not target fake news. Accordingly, KCSC's measures are to simply block and delete such misinformation.²¹ On 28 April, to prevent the spread of incorrect information, the Regulations on Emerging Infectious Disease Reporting was jointly proposed and implemented by the Journalist Association of Korea, Korea Broadcasting Journalist Association, and Korea Science Journalist Association. The regulations include basic principles and recommended expressions for reporting on emerging infectious diseases, including their transmission potential, research results, patient characteristics, and intrahospital transmissions.

Overall, the ROK's risk communication on COVID-19 has enabled the government "to engage all-directional promotional activities and public communications in a prompt manner to resolve the public's anxiety and offer accurate information for infection prevention/control."²² In addition to privacy concerns, according to the survey conducted in May, 90.3% of the population considers contact tracing of COVID-19 and information sharing as essential ways to control the outbreak.²³

However, there has been an unintended consequence associated with publicizing "too much information." In early May, daily cases dropped to single-digit numbers, without any major outbreaks or hotspots. However, on 18 May, 15 cases were confirmed in Itaewon, all of whom were close contacts to the Yongin No. 66 patient. This patient was immediately considered as a "super-spreader" in what became the Itaewon outbreak, growing to a total of 255 new cases. The patient received unwanted public attention, with both the press and the web widely showcasing personal information. In particular, the Itaewon nightclub at the epicenter of the outbreak was a gay nightclub for the country's lesbian, gay, bisexual, transgender, and queer (LGBTQ) community. The dissemination of such information has deepened the stigma associated with LGBTQ in the country. Following the Itaewon incident, the testing centers began to provide anonymous testing nationwide, allowing the public to get tested without giving names or any other information other than a single contact number for receiving the results. Later on 7 October, MOHW published guidelines for information disclosure of confirmed patients, protecting personal information and other tracking information that could lead to infringement of privacy.²⁴

²¹ Only KCSC can decide whether an information piece can be defined as fake news, rather than website administrators. KCSC informs the administrators of relevant websites of the contents of fake news, who then deletes the corresponding piece containing such content.

²² Central Disaster and Safety Countermeasure Headquarters. 2020. *Korea's Response to COVID-19 and Future Direction*. 7 May.

²³ Government of the Republic of Korea, Presidential Committee on the Fourth Industrial Revolution. 2020. *Survey results on Three Data Acts*. Press release. 18 May. <https://www.4thir.go.kr/pressRelease/detail/1131?category=report>.

²⁴ Government of the Republic of Korea, Ministry of Health and Welfare, *Guideline for public disclosure of confirmed patients' travel routes*, 7 October 2020, Sejong. (Korean) Available from: https://www.tongyeong.go.kr/_res/portal/popup/20201028/cov19.pdf.

Civil Society Participation and Community Engagement

(a) Civil Society Response to the Coronavirus Disease

In the ROK, three major civil society organizations (CSOs)—the Korea Disaster Relief Association,²⁵ Korean Red Cross,²⁶ and Community Chest of Korea²⁷—have played a key role in the country's COVID-19 response. The total amount of donations for these three major CSOs is around KRW294 billion (around \$245 million) as of mid-October. This is the largest amount of donations for any natural and social disaster in the country's history.

The significance of CSOs to the COVID-19 response is in their ready access to marginalized and vulnerable groups. In the initial period of the pandemic, the ROK experienced chaos surrounding the procurement of face masks. The government implemented a rationing system in March, and there was a strict restriction on the purchase of publicly distributed face masks, with a limit of only two masks per week for everyone. However, it was difficult for marginalized people to stand in a long queue to purchase face masks because their labor hours were at stake. CSOs provided a separate route to procuring face masks for the marginalized people who were not able to purchase otherwise.

Table 8: Donation through Civil Society Organizations, by Disaster Incidents

Disaster	Year	Donation	
		Korean Won	United States Dollar
Coronavirus disease pandemic	2020	294,312,913,750	245,260,761
Sewol ferry accident	2014	127,300,000,000	106,083,333
Daegu subway fire	2003	67,000,000,000	55,833,333
Gangwon Province mountain fire	2019	56,000,000,000	46,666,666
Pohang earthquake	2017	38,400,000,000	32,000,000

Source: Government of the Republic of Korea, Presidential Committee on the Fourth Industrial Revolution. 2020. *Survey results on Three Data Acts*. Press release. 18 May. <https://www.4th.ir.go.kr/pressRelease/detail/1131?category=report>

²⁵ The Korea Disaster Relief Association has received donations amounting to KRW96,477,718,663 (\$80,398,099) as of 1 August 2020, and spent a total of KRW77,784,207,000 (\$64,820,172) as of 30 September 2020. It mainly targeted six different groups such as disaster-vulnerable groups, low-income households, children and adolescents, people under self-quarantine, health personnel, and confirmed patients. The commodities provided are face masks (3.8 million); local voucher equivalent to cash (\$13.8 million); 30,000 tablets to support online schooling; grocery kits (77,000); necessities kits (10,500); healthy food kits (16,000), etc.

²⁶ The Korean Red Cross has received donations amounting to KRW89,419,210,000 (\$74,516,008) and spent a total of KRW86,273,533,000 (\$64,820,172) as of 14 October 2020. In terms of domestic support, it targeted disaster-vulnerable groups, health institutions and health personnel, social welfare facilities, confirmed patients, people under self-quarantine, and returning overseas Koreans and volunteers. There was a designated donation to support, so 3% of execution was used for the PRC. The commodities provided are face masks, PPEs, medical gloves, hand sanitizers, emergency response kits, emergency food sets, and medical kits.

²⁷ The Community Chest of Korea has received donations amounting to KRW108,415,985,087 (\$90,346,654) and spent KRW107,803,665,257 (\$89,836,388) as of 12 October 2020. It has reported assistance such as prevention and hygiene management; support for vulnerable groups' livelihoods; support to health personnel, volunteers, confirmed patients, etc.; and filling the social welfare service gap. In terms of commodities support, 24,804,394 face masks and 1,927,929 sanitizers have been provided.

The CSOs also filled the gaps and limitations of government support. In May, the government provided an emergency support fund in the form of a universal stipend, of approximately \$1,000 for a family of four, \$800 for a family of three, \$600 for a family of two, and \$400 for singles. However, this amount was insufficient for the lower-income group and people who had lost jobs due to COVID-19. The CSOs provided cash, emergency kits, emergency food, necessary kits, etc. for these vulnerable groups.

Along with these significant outcomes, there was also an issue associated with the execution of donations by CSOs: there was no control center to arrange and discuss the extent and scope of support across different organizations. One consequence is that there were duplicate aid beneficiaries. Interviews with the CSOs suggest that there is a long process to verify receipt verification to avoid duplicate recipients. The process heavily depends on the recipients' self-reported responses.

Another consequence is the exact opposite, in that there is a possibility for marginalized groups not on the CSOs' network and therefore neglected from support. According to an expert (to be left anonymous), the CSOs select target groups based on their existing network. This is a point where strength becomes a weakness for CSOs: their specialty in targeting vulnerable groups also makes the government rely on and utilize CSOs, potentially jeopardizing the scope of support when there are new or hidden groups unrepresented by the existing channels.

As for government engagement with CSOs, there was no rigid structure that allowed a particular response from the related parties; rather, checks and balances were naturally made through a flexible bilateral communication. According to the Disaster Relief Act, donated funds for natural disasters are executed by the Ministry of the Interior and Safety, while those for social disasters such as COVID-19 are executed by CSOs. To solve the issues pertaining to the absence of a "control center," 14 CSOs formed an alliance called Korea Disaster and Safety Network; however, the roles and activities of the alliance are yet to be uncovered.

The CSOs have clearly made a meaningful contribution to the ROK's response to COVID-19, and they are fully expected to play a major role in future natural and social disasters. Therefore, their response needs to further improve in their efficiency and transparency through this experience. The most urgent action is to establish a control center that coordinates and mediates the activities of various CSOs. Appropriate legal and institutional support must also be provided. Once the control center is established in the form of public-private partnerships (PPPs), and when it properly coordinates the activities of various organizations while hanging on to their own expertise, experience, autonomy, and long-standing trust-based network, CSOs will be able to play a much larger role in the country's disaster response.

(b) Citizen Participation in Response to the Coronavirus Disease

Government-led interventions were not the only contributors to the COVID-19 response in the ROK. Korean citizens also voluntarily carried out various activities. Software developers voluntarily made free mobile apps such as "Coronamap" based on government data, to provide real-time information on areas affected with COVID-19 and paths of infected persons. Apps such as

“Mask Map” and “Mask Inventory” were also launched, increasing the accessibility of information on pharmacies and the number of available masks at nearby locations. Furthermore, there have been many public campaigns engaging the public to overcome the crisis. For example, some people consciously passed up on the opportunity to purchase publicly distributed masks, so that more vulnerable groups and frontline health workers can readily access them. Some landlords cut down on monthly rents for their tenants. Several voluntary movements were notable, including masks for health care workers, consumption campaigns to support small local businesses suffering from the crisis, and provision of free or affordable disinfection services in public spaces. Individual citizens also took the initiative on social distancing, practicing personal hygiene, and wearing masks to collectively slow down the spread of COVID-19.

Although there were major policy-driven factors to contain the virus, such as an advanced health care system and the government’s prompt responses, the crisis would not have been properly addressed without the efforts of individual citizens. It was the people and their voluntary participation that built an invaluable sense of solidarity and togetherness during the difficult period (Box 4).

Box 4: Citizens’ Countermeasure Committee in Daegu

Following the first wave of the coronavirus disease (COVID-19) in Daegu, Daegu citizens co-founded the Citizens’ Countermeasure Committee on 21 April 2020, to gather voices from the local community and deliver policies effectively and efficiently. The committee consists of a chairman (mayor of Daegu) and 200 representatives from education, religion, Small and Medium Business Association, Senior Citizens Association, and Merchants Association, among others. According to the expert of the Daegu COVID-19 response, the committee played a key role in preventing the further spread of COVID-19 in Daegu by transforming the behavior of the public.

A systematic evaluation of the impact of the Citizen’s Countermeasure Committee is outside the scope of the present study, but it serves as a good example of civil participation and community engagement in a significantly urbanized context.

Source: Interview by the author.

(c) Academic Society’s Participation

Even before the pandemic began, there had been a very close working relationship between KCDC and academic experts, which had begun following the 2015 MERS outbreak. At the time of the MERS outbreak when the situation was quickly escalating, the disease control authority began closely communicating with academia on the MERS response and control efforts. At present, there is a strong relationship between KCDC (now KDCA) with various academic societies related to COVID-19, such as the Korean Society of Infectious Disease, the Korean Society of Preventive Medicine, the Korean Society of Epidemiology, and the Korean Society for Laboratory Medicine. Among these societies, the Korean Society of Infectious Disease has been particularly active, especially with the establishment of the government’s COVID-19 task force, which had frequent formal and informal discussions with KCDC on various issues regarding COVID-19. Also, during the initial development of COVID-19 RT-PCR diagnostics kits and diagnostic methodologies, the Korean Society of Laboratory Medicine played a crucial role, providing technical advice and ensuring the highest quality.

Response of Local Governments

Article 4 of the Infectious Control and Prevention Act states responsibilities of the central and local government, including prevention, treatment of patients, vaccination, collection and analysis of information, epidemiological investigation, research, surveillance, training specialists, international cooperation, stockpiling of medicine, evaluation, continuous monitoring, and publication. The central government's distinctive role is to draft a master plan to prevent and control infectious disease, whereas local governments are supposed to formulate and carry out their implementation plan. In practice, local governments were responsible for the operation of screening posts, epidemiological investigation of confirmed people, local communication, self-isolation supports, operation of living treatment centers, local hospital support, and disbursement of disaster support funds.

Local governments have encountered some challenges. A clear gap existed in investment and capacity between local governments in responding to infectious disease. For example, some local governments have established and have been operating independent organizations with health specialists in support of their responsibilities as early as 2012, while others have established these organizations only recently. With well-trained staff and budgets, these organizations have successfully supported the local governments' responses to COVID-19 in diverse aspects, as described in the Infectious Control and Prevention Act.

Another challenge was the shortage of health specialists in local government, such as epidemiological investigation officers or local government officials with a robust public health background. For example, in the initial phase of the outbreak, Daegu metropolitan government, serving 2.4 million citizens, had only two epidemiological investigation officers, one of whom was a public health doctor, not holding a permanent position in the city hall. In Gyeonggi provincial government, serving 13.4 million citizens, there were only six officers. Due to the shortage of human resources, the workload on existing officials has also been a severe problem. As a result, some academics, who had been working closely with the local government before the outbreak, had to work full-time in the city hall, leaving their daily research task behind. This shows the weakness of local governments in planning and executing public health policy as well as infectious disease management. The local government in Gyeonggi province reacted quickly and hired up to 65 epidemiological investigation officers by July. However, 75.4% of them are public health doctors who will leave the position in 1–2 years.²⁸ Local governments should take a medium-term perspective and invest in human resources to hire and provide proper training.

Despite these challenges, local governments were efficient and swift in meeting local needs. For example, in the initial phase of the outbreak in Daegu, local hospitals were reluctant to provide beds and workforce due to the compensation issue and stigma they experienced with MERS in 2015. The Daegu metropolitan government listened to hospitals and actively engaged in discussion with the central government to solve the problem. The Daegu government promised local hospitals that it would make active efforts in compensation and played an active role in the actual negotiation process. Another good example was in Gyeonggi province. The government operated a mental health counseling center when patients were waiting without being hospitalized due to a surge of patients. Medics called patients every day to make sure they did not have severe conditions and anxiety.

²⁸ J. Park. 2020. Strengthening local government's capacity against infectious diseases. *GRI Policy Brief*. No. 14. Suwon City: Gyeonggi Research Institute.

Some local governments have made considerable efforts to listen to residents, something the central government has not done well. For example, Daegu metropolitan government has been organizing a fortnightly online committee with over 200 representatives from various local social sectors. Local governments shared updates on the current local policy direction and asked for opinions and suggestions. Leaders from various communities, each representing the self-employed, seniors, and medical professionals, could bring their agenda to the committee and set their prevention measures during the discussion.

Vaccination

Securing Vaccines

On 8 December 2020, the government announced its strategy to secure vaccines. The government's initial plan to secure vaccines was to be a two-step process: securing vaccines for 60% of the population in the first stage, then procuring additional vaccines considering supply and demand trends; and domestic vaccine development. However, as the third wave began in late November, public criticism of the lack of vaccines increased. The government held a meeting of related ministers on 23 November and decided to secure the maximum supply. On 8 December, the government's press release confirmed that the COVID-19 Vaccines Global Access (COVAX) Facility would provide 10 million doses of vaccines, and companies would supply additional 34 million doses through bilateral agreements. Vaccination will proceed in March and April 2021. In addition to AstraZeneca's 20 million doses, contracts were completed on 24 December with Pfizer (20 million doses), Janssen (6 million doses); and on 31 December with Moderna (40 million doses), for a total of 86 million doses. Vulnerable populations, including senior citizens and chronically ill people, and medical personnel will be the first ones to get the vaccine.

Preparing for Vaccination

On 8 January 2021, the government strengthened the vaccination task force for the vaccine's swift and safe delivery.²⁹ The task force secured legal grounds and more staff from related ministries of the government. The task force comprises a situation management team, a vaccination management team that manages vaccination plans and human resources, a resource management team in charge of vaccine introduction and distribution, and a damage compensation review team responsible for monitoring abnormal reactions and damage compensation. The pan-government approach is also notable. More than 70 people will participate in the team, including from the Ministry of Justice, Ministry of National Defense, National Police Agency, Ministry of Food and Drug Safety, and Ministry of Public Administration and Security. The team shall also reflect experts' voices by operating expert participation committees, advisory groups, and medical consultative bodies. Each team also manages and supports each local government vaccination promotion group.

²⁹ Government of the Republic of Korea, Korea Disease Control and Prevention Agency. 2021. *Initiation of Vaccination Task Force*. Press release. 8 January. <https://www.korea.kr/news/pressReleaseView.do?newsId=156431206>.

Investment in Research and Development

The government-affiliated National Institute of Health announced a research plan for developing vaccines and treatments (5 February 2020) in the early days of the COVID-19 crisis, identified the demand for research tasks, and secured related budgets.³⁰ The government has set up a pan-government committee for the development of COVID-19 treatments and vaccines, co-chaired by the Ministry of Health and Welfare and the Minister of Science and information and communications technology. The committee set a goal of developing treatments and vaccines by 2021 and securing the global competitiveness of medical devices by 2022. The committee has nonclinical phase policies (support for use of biosafety Level 3 facilities for industry-academic cooperation, animal model experiments, toxicity testing) and clinical phase policies (clinical trial budget support, multi-agency clinical trial center, and overseas clinical trial support).³¹ As of January 2021, the single-clone antibody treatment has completed phase II, and a vaccine has been approved for phase I.

Participation in the COVAX Facility

The COVAX Facility is a global initiative for fair distribution of vaccines, coordinated and led by the WHO; Coalition for Epidemic Preparedness Innovations and the Vaccine Alliance (GAVI). Successfully tested vaccines for COVID-19 will go through COVAX Facility so that the international community can make them a public good, ensuring fair allocation of the vaccine to low-income countries. GAVI's role is to allocate vaccines to countries that have not yet met the target threshold of 20% of their population vaccinated, as well as keep 5% of the total doses as a global stockpile. There are also initiatives to provide LMICs, in addition to the COVAX Facility support, an Advanced Market Commitment that would help their procurement of the vaccine upon its successful development. Other than the supply of the vaccine itself, other resources necessary for deploying vaccination, including cold chain equipment such as refrigerators, are also in the discussion for additional global support to LMICs, along with support for the regional public health systems.

The ROK has submitted its expression of interest to GAVI, signaling a likely participation in the COVAX Facility mechanism, and aims to procure 10 million doses through the initiative, a third of the country's 30 million target. At the same time, the ROK is also participating in the funding of GAVI and is part of the 14-country consultative "Friends of the COVAX" group, thoroughly endorsing the multilateral platform.

³⁰ Government of the Republic of Korea, Ministry of Health and Welfare. 2020. *NIH to initiate the development of treatments and vaccines*. Press release. 5 February. http://www.mohw.go.kr/react/al/sal0301vw.jsp?PAR_MENU_ID=04&MENU_ID=0403&page=1&CONT_SEQ=352709.

³¹ Pan-government committee for supporting the development of COVID-19 treatments and vaccines, Government policies for developing COVID-19 treatment and vaccine. 2020. Available from: http://www.mohw.go.kr/react/al/sal0301vw.jsp?PAR_MENU_ID=04&MENU_ID=0403&page=1&CONT_SEQ=360113.

Health Emergency and Disaster Risk Management

The Health-EDRM framework was developed by the WHO based on the Sendai Framework for Disaster Risk Reduction to strengthen the approach in health emergencies, including infectious diseases, epidemics, and pandemics. The framework outlines seven guiding principles applicable to health-related emergencies: that the appropriate response system is (i) risk-based; (ii) comprehensive in terms of management; (iii) applicable to all hazards; (iv) inclusive, people, and community-centered; (v) multisector and multidisciplinary; (vi) whole-of-health system-based; and (vii) ethical.

- (i) **Risk-based approach.** This guiding principle calls for preventing and mitigating potential hazards based on their evaluated risks, as opposed to event-based approaches that take realized events as the basis for decision-making. In this regard, the ROK's response to COVID-19 can be described as well-prepared, as the outbreak was preceded by a gradual organizational restructuring of the infectious disease response governance since MERS, greatly enhancing the country's institutional readiness for comprehensive disease preparedness. Point-of-entry surveillance was strengthened prior to the domestic outbreak, effectively suppressing disease importation to a minimum. Establishment of the Emergency Operation Center and increased capacity of the Epidemic Investigation Service, both preceding the outbreak, also played a major role in the country's COVID-19 response.

On the other hand, there were shortcomings in the country's response from the viewpoint of risk-based approach. First, the limited technical capacity of local governments was revealed when the PPE shortages materialized. Also exposed were the shortage of public beds available for instant emergency use. The country's health care system could improve on these points after the pandemic, but a thorough risk-based approach can and should prescribe such areas for improvement as a result of the COVID-19 response experience.

- (ii) **Comprehensive approach.** This principle refers to the interrelated activities in the entire sequence of the hazard timeline, including the stages of prevention and/or mitigation, emergency preparedness (including operational readiness), response, and recovery. "It is based on the premise that prevention and mitigation measures can reduce the likelihood and severity of emergencies; that sound preparedness will lead to more timely and effective response; that coordinated response will result in appropriate targeting of health services to the needs of those affected with a focus on the most vulnerable; and that recovery and reconstruction should be designed to reduce the risks of future emergencies (Build Back Better approach, including strengthening of health systems)."³²

³² WHO. 2019. *Health Emergency and Disaster Risk Management Framework*. Geneva.

The ROK's capacity for comprehensive response has greatly improved since the MERS outbreak. This was facilitated by the amendment of the Infectious Disease Control and Prevention Act. Overall, the country's responses can be considered as soundly coordinated as a result of the structural preparation earned through experience.

- (iii) **All-hazard approach.** The Health-EDRM framework states that policies, strategies, and related programs should be designed to address common issues with common capacities, supplemented by risk-specific capacities. There are some areas of practice in the ROK where this principle was applied. Even before the pandemic erupted, the Integrated National Disaster Response System had been introduced, as well as the Disaster Resource Sharing System across different sectors of the government. Of course, some of the infectious disease-specific response capacities were also crucial, but these systems guided the government's preparedness for various types of disasters that could affect the country. In the case of COVID-19, the Integrated National Disaster Response System provided legal and systematic support for utilizing inter-sector resources beyond a single type of disaster, involving ministries beyond MOHW. Also, the Disaster Resource Sharing System functioned as an enabler for resource mobilization during the COVID-19 outbreak: risk communication systems were integrated across sectors so that they can deal with any type of national disaster. Notable channels such as daily briefings by CDSCH and sending of alert messages to the public were well utilized during the COVID-19 outbreak as efficient means of communication.
- (iv) **Inclusive, people, and community-centered approach.** This principle starts with the aspect of planning *with* communities, as opposed to planning *for* them. Building on the "whole-of-society" concept, effective Health-EDRM can only be achieved through the active participation of local governments, civil societies, volunteer organizations, the private sector, and individual citizens. In terms of inclusivity, the very presence of universal health coverage can be highlighted, as the NHIS enabled testing and treatment service accessible to any citizen in the country at no cost. Furthermore, treatment was provided for free to foreign nationals, another example of the inclusive nature of the ROK's COVID-19 response. The case study of citizens' countermeasure committee in Daegu Metropolitan City, which is still in active operation to deal with COVID-19 outbreak situation, is one of the examples of an inclusive, people-centered approach, giving a platform for the formerly quiet voices of civil society groups to be heard.

Some of the ROK's weaknesses in its response included the lack of citizens' representation in the National Committee for Infectious Disease Control and Prevention in Daily Life. Protecting vulnerable populations was another shortcoming, including in psychiatric hospitals and highly populated workplaces such as call centers; as were issues around the stigmatization of LGBTQ communities.

- (v) **Multisector and multidisciplinary collaboration.** At the government level, the whole-of-government approach was successfully implemented. Fiscal policies from the Ministry of Economy and Finance and monetary policies from the Bank of Korea were in harmony to mitigate socioeconomic damages caused by social distancing measures.

To minimize the deprivation of education for children, health experts and education experts made various efforts to create a safe school environment. Collaboration among the government, civil society, and professional organizations was also adequate. For example, civil society played an active role in reaching out to the vulnerable population with local governments. While CSOs are proactive and independent, and while there are ways in which the government can request civil participation and support, it is never expected or considered mandatory. Press organizations have drawn their own reporting guidelines to help the effective risk communication of the KDCA.

To be sure, the whole-of-government approach took place in multiple sectors, but the question remains whether the approach is ingrained sufficiently and sustainably in the system. For example, in deciding on school closings and reopening, a closer review of the associated collateral impact and medium to long-term measures is required.

- (vi) **Whole-of-health, system-based approach.** This principle values strengthening the health system in general, ensuring high coverage for essential services, and integrating the principles of the Health-EDRM framework with national, regional, and local policies; health care delivery; and public health programs. In this regard, the ROK benefited significantly from its NHIS, which has continued to develop over 40 years. Thanks to the strong finance and inclusiveness of the NHIS, the whole population, including foreigners, were able to receive testing and treatment without any financial burden, promoting equity of health during the uncertain times. The country also delivered the principle of whole-of-health approach to policies at different levels of health care delivery. Under the specific guidelines of MOHW and KDCA, health facilities such as public health centers, clinics, and hospitals were able to clearly distinguish their roles and establish a cooperative system within the region to provide safe and efficient care to patients. The fact that policies and programs have promoted mental health to be important as physical health shows that cooperation among various sectors of health care has been smooth.

The National Mental Health Center and the National Knowledge Center organization have worked together to provide psychological counseling services to confirmed persons, families, and the general public.³³ According to the National Center for Disaster Trauma press release, about 400,000 psychological consultations were done from March to September 2020.³⁴ To secure continuum of care for patients with chronic diseases, the government intervened in various measures including temporary relaxation of telemedicine regulation and temporary operation of “respiratory” clinics. According to government reports, there were above 940,000 phone prescriptions until October 2020, while the installation and/or operation performance of the respiratory clinic was minimal. It remains to be seen how the management of chronic patients is carried out until the end of the pandemic.

³³ J. Hyun et al. 2020. Psychosocial Support During the COVID-19 Outbreak in Korea: Activities of Multidisciplinary Mental Health Professionals. *Journal of Korean Medical Science*. 35 (22, June). e211. <https://doi.org/10.3346/jkms.2020.35.e211>.

³⁴ National Center for Disaster Trauma. 2020. 8 September. <https://nct.go.kr/serviceCenter/pressDetail.do?refnceSeq=408>.

The COVID-19 outbreak consistently revealed a structural weakness in the country's health care delivery system: abnormally high dependence on privately owned hospitals and beds. As the need for rapid and adequate mobilization of beds prompted the government to designate most of its public hospitals for outbreak-specific activities, continuity of care was jeopardized for general patients who had been paying regular visits to these public hospitals.

- (vii) **Ethical considerations.** While the term can refer to a wide variety of concepts, the Health-EDRM framework considers health as a basic human right, and as such, the key factor is whether the government's COVID-19 response protects the right to health of its people. One clear aspect of strength was in the country's inclusiveness for immigrants and foreign travelers, which meant that the country weighed the health need as a priority over people's ability to pay. Consultation on COVID-19 was provided in 8 different languages through 1,339 call services, and other information such as individual hygiene and prevention were available in 31 languages.

However, because there are so many different groups of individuals and parties of interest, it is difficult to assure diversity and representation in emergency situations. There was limited success in the ROK's response in this regard. There were personal information and privacy issues at the heart of the response, especially amid the country's aggressive approach to tracing. As stated earlier, stigmatization of LGBTQ communities was an unfortunate repercussion to the Itaewon outbreak.

A summary of the seven guiding principles as demonstrated in the ROK's response to COVID-19 is presented in Table 9. Although the authors took liberty in using "strengths" and "weaknesses" in the interest of simple and intuitive discussion, the readers should also consider that some components of the Health-EDRM framework naturally apply well to certain areas of the response and not as much to others.

Table 9: Health Emergency and Disaster Risk Management Principles Applied by the Republic of Korea in Its Coronavirus Disease Response

Principle	Strengths	Weaknesses
Risk-based approach	<ul style="list-style-type: none"> • Institutional readiness for disease preparedness system established in KCDC after organizational restructuring since MERS • Strengthened POE surveillance against disease importation • Emergency Operation Center • Number of epidemic investigation officer increased • Emergency use authorization 	<ul style="list-style-type: none"> • Limitations to technical capacity of local governments • Lack of buffer capacity: shortage of instantly available beds in public hospitals
Comprehensive emergency management	<ul style="list-style-type: none"> • Comprehensive infectious disease response governance capacity enhanced since MERS • Amendment of the Infectious Disease Control and Prevention Act since MERS • Coordinated response overall 	<ul style="list-style-type: none"> • None
All-hazard approach	<ul style="list-style-type: none"> • Recent introduction of Integrated National Disaster Response System • Presence of the Disaster Resource Sharing System • Risk communication system, e.g., daily briefing by Central Disaster and Safety Countermeasure Headquarters (CDSCH) and emergency alerting system using text messages 	<ul style="list-style-type: none"> • None
Inclusive, people- and community-centered approach	<ul style="list-style-type: none"> • Presence of universal health coverage • Free treatment for COVID-19 infected foreign nationals • Citizens' countermeasure committee in Daegu Metropolitan City 	<ul style="list-style-type: none"> • Protection of the vulnerable population including psychiatric hospitals and highly populated workplaces, e.g., call centers • Stigmatization of LGBTQ communities • Lack of opportunity for various minorities and low-income citizens to participate in the discussion for infectious disease control and prevention
Multisectoral and multidisciplinary collaboration	<ul style="list-style-type: none"> • Whole-of-government approach was well implemented • Collaborative approach between education and health sector • Civil society organizations played a complementary role to the government 	<ul style="list-style-type: none"> • Details of policy making should also accompany intersectoral discussion and coordinated efforts • Limited depth and sustainability of discussion in terms of the whole-of-government approach
Whole-of-health system-based	<ul style="list-style-type: none"> • Strong finance and inclusiveness of the NHIS • Shared responsibility and close collaboration between public health centers and health facilities (i.e., clinics and hospitals) • Psychosocial support provision guideline and support program in place, including operation of psychological support call centers • Temporary relaxation of telemedicine regulation for patients with chronic disease such as diabetes or hypertension 	<ul style="list-style-type: none"> • High dependence on privately owned hospitals • Designating too many public hospitals for COVID-19 makes continuum of care difficult for certain patient groups
Ethical consideration	<ul style="list-style-type: none"> • Provision of free treatment for all • Provision of consultation on COVID-19 situation in 8 different languages through 1,339 call services. • Provision of information on individual hygiene and prevention in 31 languages 	<ul style="list-style-type: none"> • Personal information privacy issue • Stigmatization of LGBTQ communities

COVID-19 = coronavirus disease; KCDC = Korea Centers for Disease Control and Prevention; LGBTQ = lesbian, gay, bisexual, transgender, and queer; MERS = Middle East Respiratory Syndrome; NHIS = NHIS; POE = point of entry.
Source: Authors.

VII

Lessons Learned

The overall evaluation of the ROK's response through the Health-EDRM framework ultimately leaves us with insightful lessons going forward. These lessons may also be transferred to other Asian Development Bank member countries and therefore should be noted for their policy design. The following are the points considered as particularly noteworthy to the ROK's success.

- (i) **Legal and institutional readiness.** There were legal grounds for the use of private mobile global positioning system information to allow efficient contact tracing, and EUA for the rapid approval of diagnostic testing kits. Having the legal basis in place prior to the event allowed the usage of mobile phone location and credit card logs when needed, leading to speedy and tightened contact tracing in the country. The presence of EUA also allowed rapid approvals for commercial testing kits.
- (ii) **Universal health coverage.** Providing free tests and treatment for the entire population encouraged people with symptoms to get tested without financial concerns, which not only protected vulnerable sectors but also the rest of the population, by collectively reducing infection risk at the society level. In a universal health insurance setting, no one loses their health insurance following unemployment. There was a smaller chance of deterioration of health due to job loss compared to that in other countries with no universal health coverage. Although we observe disproportionately distributed numbers of cases by socioeconomic status, universal health care seems to be a mitigating factor of the disparity.
- (iii) **Public resources for efficient and swift mobilization of hospital capacities and workforces.** Depending on the context, PPP could be more efficient in mobilizing hospital beds and ICUs. In such cases, building mutual trust is a key for cooperation, which requires timely compensation schemes, fluid communication, and good relationship-building in advance. Even in the situation where PPP works better than conventional public systems, a minimum level of public health care provision should be secured not only for mobilizing beds, but also for regular patients of those public hospitals.
- (iv) **Securing domestic production facilities and/or stockpiling of supplies.** This is essential especially for early procurement of high-quality PPE. There was no serious PPE shortage in the ROK, owing to local production capacity and PPPs; thus, there were relatively few infections or deaths of medical personnel as a result. Even high-income countries such as the United Kingdom import most of their supplies and hence is prone to PPE shortage or quality issues. Governments should not only directly support high-quality production industries, but also stock up on months of PPE supplies. In addition to these practices, LMICs can also secure PPE supplies or build production capacity in conjunction with official development assistance strategies.

- (v) **Local governments with their own capacity.** In case of simultaneous outbreaks across the country, each local government should be equipped with competent response capabilities and take the driver's seat in the response governance. From local laboratories to EIS officers, local governments should secure their own local resources in preparation for potential health disasters.
- (vi) **Prompt decision-making and bold execution of disease control policy.** These are crucial for containing any infection. As COVID-19 has high transmissibility with substantial proportions of asymptomatic cases, controlling the spread becomes extremely difficult once community transmission begins. Thus, prompt policy decision-making at the earliest phase of the outbreak with immediate execution of disease control measures appears to be crucial in controlling the spread.
- (vii) **Aggressive approach to undertake prompt and large-scale testing, tracing, and isolation and/or quarantine.** These are instrumental to curbing transmission. It is crucial to deliver testing and contact tracing quickly, so that any possible COVID-19 infected patients could be immediately isolated. This will enable effective disruption of any further transmission of the disease, effectively suppressing the possibility of outbreak escalation. This is also applicable for LMIC RT-PCR testing, which should be made available as much as possible, as it is the gold standard of testing for COVID-19. However, if there is a lack of resources or capacity, using the method of pooling tests or antigen rapid testing kits could be an option.
- (viii) **Social distancing including mask policy.** These are important especially when there are no vaccines and effective treatments available. Without vaccines and treatments, the next-best options are nonpharmaceutical interventions such as social distancing and wearing masks. Masks would not only prevent other people infecting the mask-wearer but also reduce the chance of the mask-wearer passing down the virus, which may prove even more important.
- (ix) **Cost of lockdown and social distancing.** The repercussions of lockdowns and social distancing should not be underestimated. The ROK faced one of the smallest economy shocks among OECD countries even without a nationwide lockdown. Nevertheless, social distancing jeopardized education opportunities for children, increased unemployment of low-skilled workers and women in their 20s and 30s who were caring for children, and exposed the self-employed. These social costs are not as fully observed in policy outcome measures as the number of infections or death toll. Therefore, these social costs must be proactively and systematically measured and reflected in policy decisions.
- (x) **Close partnership and collaboration with academic expert society can be beneficial.** Finding sufficient expertise within the government organization is not easy. The Korean government made full use of its partnership with academic societies, such as the Korean Society of Infectious Disease, the Korean Society of Preventive Medicine, and the Korean Society of Laboratory Medicine. These societies provided technical advice for timely response and collaborated closely with specific disease control efforts such as contact tracing and supporting health authorities at provincial and municipal levels. LMICs can have added difficulties in finding technical capacity within the government, so collaboration with academic societies and local universities can be crucial.

- (xi) **Daily briefings as a channel of risk communication.** These were highly effective in the ROK and could also be implemented in LMICs. Briefings send information across regions effectively, accurately, and immediately. Some member states have a population who better use radio than television as the primary channel for everyday information access, so the conduct of daily briefings in these member states should take a modified platform centered around radio-based communication. As was the case in the ROK, the key to success still depends on fast, impartial, open, transparent, and evidence-based risk communication.
- (xii) **Role of civil society organizations.** CSOs in the ROK played a complementary role to the main roles of the government and can be crucial in situations with limited government capacities. However, LMICs could utilize CSOs even more. The central and local governments should be the control center that oversees the efficient distribution of various support from international organizations and CSOs. Key supplies at shortage and key regions at risk should be monitored in advance, so that support can be executed immediately upon approval in a well-controlled manner.

VIII

Conclusion

Underpinning the ROK's COVID-19 response was a painful process of learning from its mistakes in the MERS outbreak. As explained in each of the sections, the health structure, legislation, human resource, policy, guidelines etc. were all reformed and reinstated after the MERS outbreak, which provided enough buffer to defend against the early stages of COVID-19 in a systematic response. At present, COVID-19 has not come to an end, so it is appropriate to close the discussion with a conclusive result. However, it is certain to say that learning from the past and building a resilient system over long periods of time helped the country to prepare well for its initial response to COVID-19.

Both the country's health system and governance structure are considerably in line with the basic requirements to reflect the seven guiding principles suggested by the Health-EDRM framework, but there are some questions on whether they functioned to fully integrate these principles. Some of the principles, including the multisector approach and the whole-of-health system-based approach, was kept as different institutions communicated over the response measures, but whether their communication ultimately led to a democratic coordination and made an impact on policy decisions remains to be analyzed and evaluated after the end of this COVID-19 pandemic. It is also regrettable that the voice of the low-income and the minority were yet to be listened to, especially when they are ultimately the ones to suffer the most.

There is an ongoing debate on the sustainability of the strategies used for infection control and for the Korean economy. Some argue that the level of social distancing should not be escalated, quoting both sustainability and economic issues, while others argue that successful virus containment can save the economy in the long run. Mitigation strategies without a rigorous health system capacity are not appropriate and can lead to excessive rates of mortality; meanwhile, a long-term suppression strategy is not the answer either. The bottom line is that governments should ensure sufficient health system capacity to treat critical patients before easing down on social distancing.

There are two critical factors to consider for sustainability: the risk associated with vulnerable groups and the extent of citizen participation in decision-making. The vulnerable groups include those with employment and/or financial status at risk when the level of social distancing is raised. Government should provide timely and adequate financial support for the vulnerable, including small business owners and workers in the informal sector. On the other hand, decision-making structures should be a platform where citizens' voices can be heard, as they often accompany value judgment. As suggested by the Health EDRM's guiding principles, decisions are not made *for* the people; rather, they are made *with* the people.

Although the ROK has shown substantial achievement, countries with low resource settings should take caution in applying the same approach as is. It is necessary to tailor the strategy in a suitable and sustainable manner for each situation to protect the population's health, and to constantly reflect their strategies on the seven principles of the Health-EDRM framework. In the long run, it is the resilience of the overall society and health systems that will determine the quality of response for new infectious diseases to come.

As a final remark, the authors present 10 key takeaways and action points for developing member countries based on the ROK's experience in its COVID-19 response:

- (i) establish infectious disease management governance and mechanism;
- (ii) whole-of-government approach for all types of hazards including infectious disease control and response;
- (iii) strengthen universal health care for proving testing and treatment without financial burden;
- (iv) maintain essential health services with a robust primary health care system;
- (v) prepare legal and institutional bases to better respond in advance to pandemic situations (such as EUA, PPE, vaccine procurement regulation);
- (vi) enhance health communication capacity for timely sharing of accurate information with the general public and communities;
- (vii) undertake prompt decision-making and bold execution of disease control and response measures;
- (viii) be open to explore and deploy innovative approach and measures as long as it is evidence-based and expert-consulted;
- (ix) employ a balanced approach between disease control measures (including social distancing and lockdown) and socioeconomic measures; and
- (x) adapt the Health-EDRM framework and its seven key principles in combating any public health emergency using whole-of-society and multisector, multi-institutional, multidisciplinary, as well as well coordinated approach to make a resilient health system and society before the inevitable arrival of future pandemics.

The Republic of Korea's Coronavirus Disease Pandemic Response and Health System Preparedness

There was a time when the Republic of Korea (ROK) became the second highest in the world for the number of daily confirmed cases of the coronavirus disease (COVID-19). But the country was able to quickly suppress the surge and reduce the number of confirmed cases. This report discusses the key factors for the successful response of the ROK to COVID-19 during the early phase of the pandemic. It analyzes how the ROK has performed in terms of comprehensive disaster risk management. The report also discusses lessons that the Asian Development Bank's developing member countries can learn from the ROK's COVID-19 response experience.

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