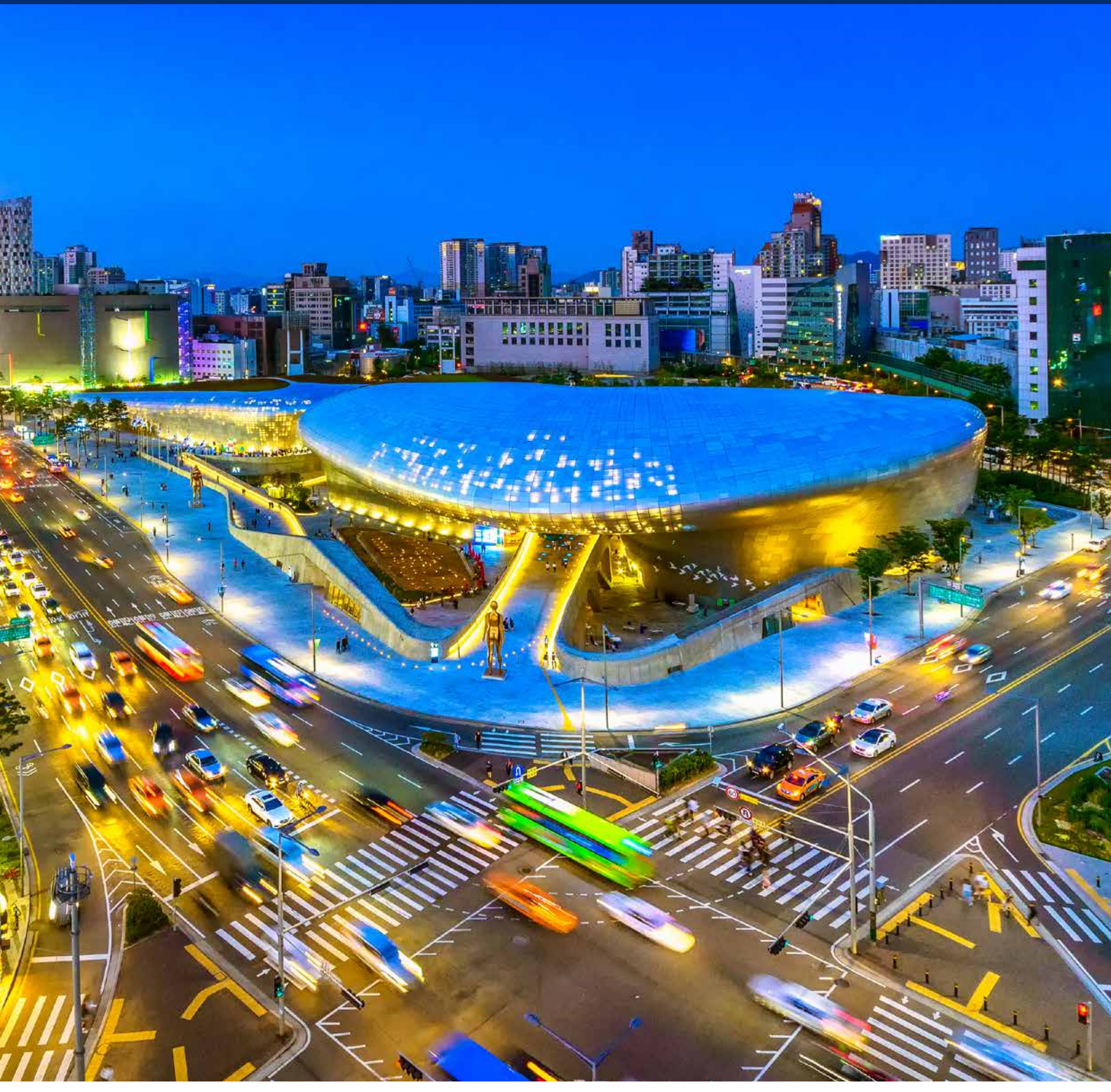
Korea – World Bank Group Partnership On COVID-19 Preparedness and Response

Country Case Study: **The Republic of Korea**

by Taejin Lee, Hongsoo Kim, Sung-il Cho, Myoungsoon You, Wankyo Chung, and Juhyeon Moon



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On the cover: Night view of Dongdaemun Design Plaza (DDP) in Seoul

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ACRONYM	EXPANDED FORM
ASEAN	Association of Southeast Asian Nations
CCTV	Closed-circuit television
CDCH	Central Disease Control Headquarters
CDMH	Central Disease Management Headquarters
CDSCHQ	Central Disaster and Safety Countermeasure Headquarters
CHE	Catastrophic health expenditure
COVID-19	Coronavirus disease 2019
CTC	Community treatment center
DUR	Drug usage review
EAP	East Asia and Pacific
EBS	Educational Broadcasting System
EIS	Epidemic Intelligence Service
EUA	Emergency use authorization
EUA	Emergency use authorization
FETP	Field Epidemiology Training Program
GDP	Gross domestic product
GEPP	Global epidemic prevention platform
GPS	Global Positioning System
HIRA	Health Insurance Review and Assessment Service
ICT	Information and communication technology
ICU	Intensive care unit
IDCPA	Infectious Disease Control and Prevention Act
INGO	International nonprofit organization
IT	Information technology
KCDC	Korean Disease Control and Prevention Agency (now KDCA)
KCPC	Korea Center for Disease Control and Prevention
KDCA	Korea Disease Control and Prevention Agency
KIHASA	Korea Institute for Health and Social Affairs
KIHASA	Korean Institute for Health and Social Affairs
KMA	Korean Medical Association

ACRONYM	EXPANDED FORM
KOSIS	Korean Statistical Information Service
KWDI	Korean Women's Development Institute
LTC	Long-term care
MERS	Middle East respiratory syndrome
MFDS	Ministry of Food and Drug Safety
MOE	Ministry of Education
MOEF	Ministry of Economy and Finance
MOHW	Ministry of Health and Welfare
MOJ	Ministry of Justice
MSIT	Ministry of Science and Information and Communication Technology
NARS	National Assembly Research Service
NDIU	National designated isolation units
NHI	National Health Insurance
NHIS	National Health Insurance Service
NIA	National Information Society Agency
NPIR	Negative pressure isolation rooms
NPIR	Nonpharmaceutical interventions
NQSN	National Quarantine Service
OOP	Out-of-pocket
PCR	Polymerase chain reaction
PPE	Personal protective equipment
PPP	Public and private partnership
QR	Quick response
RIPHE	Research Institute of Public Health and Environment
ROK	Republic of Korea
RT-PCR	Real-time polymerase chain reaction
SARS	Severe acute respiratory syndrome
SMER	Small and medium-sized enterprises
SNS	Social networking service
SQIS	Smart quarantine information system
UHC	Universal health coverage
WASH	Water, sanitation, and hygiene

EXECUTIVE SUMMARY

(Left) Night view of Gangnam district in Seoul (Center) A high school student getting a vaccine shot (Right) A traveler sitting on a safety bench in a bus terminal

This case study aims to describe the Republic of Korea's preparedness and response to coronavirus disease 2019 (COVID-19) and the resultant impact of the pandemic on the health of its citizens and the economy. Korea has been recording COVID 19-related epidemiological data since January 20, 2020, when the first imported confirmed case of COVID-19 occurred. Since then, Korea has undergone four surge waves, which posed different challenges and cumulative negative impacts. The government implemented and revised social distancing policy measures, as appropriate, to maintain a balance between acceptable risk and disease burden, while promoting vaccination. The fiscal policy also has kept an expansionary stance to cushion the economic effects of the pandemic.

The report has four chapters, with subtopics. The Preparedness chapter describes the policy and governance measures, as well as the health care system, that facilitated prompt surveillance and early policy making. The Response chapter describes seven components, including the response of the government, the health system, and the public, to contain COVID-19; vaccination; protecting vulnerable people; innovation through leapfrogging; and measures to contain COVID-19 from a human capital perspective. Each component describes how Korea has dealt with the pandemic. The third chapter emphasizes the impact of the COVID-19 pandemic on the progress of universal health coverage (UHC) and sustainability, and the last chapter discusses lessons learned for the future and for other countries, including best practices and challenges.

Korea has been relatively successful in containing the pandemic, reducing its economic impact, and maintaining public trust during the prolonged period. Several factors have contributed to this. The government structure facilitated expedited decision-making and empowered public-private partnership for a timely response, backed by a concrete legal basis and institutional infrastructure. Transparent risk communication and information disclosure, with specific guidelines, allowed redistribution of resources and infection control activities.

It is always important to learn from previous experiences to be well prepared for the next crisis. Even if regulations are in place to effectively respond to new infectious diseases, it is necessary to be open to the revisability of the legal framework, depending on the actual situation. Extensive testing and contact tracing combined with flexible social distancing measures are highly effective in containing the spread of infectious diseases and reducing the number of new cases, which in turn helps to alleviate the burden on the health system, until vaccines and medicines are developed and become available. It is important to provide appropriate care for patients, depending on the severity of disease, and to reduce the burden on the health system to minimize mortality.

However, it should be borne in mind that policy measures used in Korea such as extensive testing, tracing, and social distancing could not be successful without dedicated health professionals as well as the cooperation of citizens. It is necessary to devise effective communication methods, as the public's perception of the government's briefing and text messages deteriorates during a prolonged pandemic. For policy makers, it is necessary to determine an optimal level of social distancing, not only to save as many lives as possible, but also to ensure the livelihood of the citizens.

Korea has been relatively successful in containing the pandemic, reducing its economic impact, and maintaining public trust during the prolonged period.

View of Deoksugung royal palace

1. INTRODUCTION: SOCIOECONOMIC IMPACTS OF COVID-19

1.1 Epidemiology of COVID-19 in Korea

The Republic of Korea has recorded COVID 19-related epidemiological data since January 20, 2020, when the first imported confirmed case occurred (figure 1). The number of daily confirmed cases rapidly increased due to local outbreaks in February, exceeding 10 per million population. During that period, the government established "drive-thru" screening clinics and announced the "Social Distancing Policy" instead of a draconian lockdown. Since then, Korea has faced four surge waves, with each subsequent wave posing new challenges and resultant cumulative negative impacts. In 2020, the number of daily confirmed cases ranged from zero to 20 per million population, with a daily COVID-19-related fatality of not more than 40 persons. However, due to the emergence of SARS-CoV-2 variants, and the delayed availability of vaccinations, the number of new confirmed cases peaked at over 620,000 on May 16, 2022, raising the death toll to 24,555 as of June 30, 2022. The level of social distancing was adjusted to control virus transmission and mobilize medical resources.

As the number of daily confirmed cases continued to exceed 10 per million population in 2021, the originally articulated zero-COVID policy was determined not to be achievable. The government altered social distancing policy measures and promoted vaccination, with the objective of balancing an acceptable risk and disease burden. During the latter half of 2021, the number of confirmed cases increased to 30 per million population in September, 50 per million population in October, and over 100 per million population in December. Although vaccinations helped to reduce mortality, the cumulative number of deaths from COVID-19 continued to show an upward trend in 2022 with the emergence of the Omicron variant. The government promptly suspended the "Gradual Return to Normal Plan" launched in November 2021. In response to the emergence of the Omicron variant, the government announced reinforced response measures, including the at-home treatment system.[1] However, the number of confirmed cases increased significantly from February 2022, accumulating to over 354,000 per million population (over 18.3 million cumulated cases) by June 30, 2022. Although it took a few more months for the Omicron surge to settle, the case fatality rate remained at around 0.1 percent between March and June 2022.

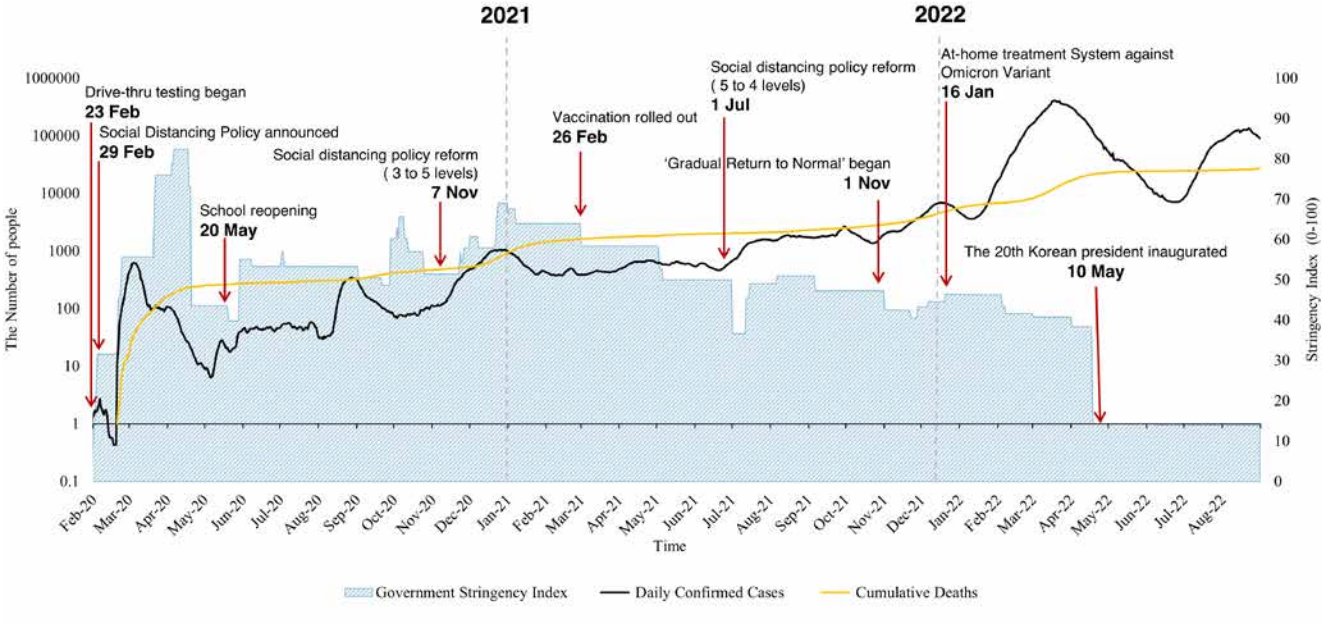
1 In the emergence of the Omicron variant, KDCA announced a new strategy against Omicron on February 10, 2022, which adjusted the existing self-isolation and quarantine scheme to a more autonomous self-treatment scheme. Under the new scheme, public health workers of local governments delivered treatment kits that consist of COVID-19 self-testing kits, fever reducers, a thermometer, a pulse oximeter, and disinfectants (KDCA 2022b).

Although the total number of confirmed cases is on average like that of other (OECD) member countries, the cumulative number of deaths is relatively small.

After reporting the peak in mid-March, with 621,317 daily confirmed cases on March 16 and 470 daily deaths on March 23, the numbers gradually decreased. As of June 30, 2022, the cumulative confirmed cases and deaths per million reached to 354,400 and 473, respectively. Although the total number of confirmed cases is on average like that of other Organization for Economic Co-operation and Development (OECD) member countries, the cumulative number of deaths is relatively small. *This demonstrates that preparedness and response can make a difference in the risk and mortality of infectious diseases.*

In early 2020, the proportion of new confirmed cases reflected age-based vulnerability—the elderly have a greater incidence, whereas the incidence among people in their 20s is variable. From 2021, the incidence smoothed out to an even distribution among the economically active population (ages 20 to 59 years). The proportion of new confirmed cases among those under 19 years of age has incrementally mounted, although that population group has not contributed significantly to the number of cumulative deaths. Half of all COVID-19 deaths have been in the population group ages 80 years or older, and another 40 percent has been among those ages 60 to 79. The elderly who succumbed tended to have multiple underlying diseases such as diabetes and cancer, with a higher severity during hospitalization (Byeon et al. 2021, Seong et al. 2021).

Figure 1: COVID-19 Pandemic and Government Responses in the Republic of Korea



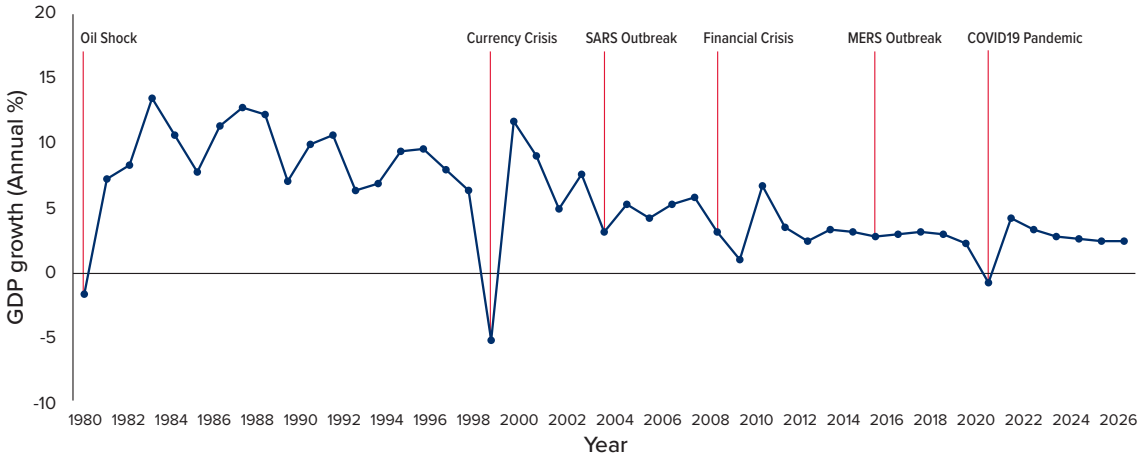
Note: Based on Our World in Data and Korean Ministry of Health and Welfare

1.2 Socioeconomic impact of COVID-19

Korea (total population 50 million) has achieved economic growth, with its per capita gross domestic product (GDP) exceeding US$30,000 in the late 2010s. However, since the 1980s, infectious diseases and economic crises have intermittently impacted economic growth and social institutions (figure 2). The Severe Acute Respiratory Syndrome (SARS) outbreak in 2003 in the region, and the Middle East Respiratory Syndrome (MERS) outbreak in 2015, stimulated a focus on infection control and the development of nonpharmaceutical public health interventions. The objective of reducing infection-related mortality institutionalized the role and responsibility of different partners in preventing and responding to emerging infectious diseases. In addition to the health impact of the SARS and MERS outbreaks, the tourism industry was negatively impacted because of the travel restrictions (Joo et al. 2019, Kim et al. 2009). Korea learned that the impact and severity of an infection was proportional to its impact and spread in society. Consistent and systemic interventions at an early stage played a pivotal role in preventing losses not only of lives, but also in the economy, during the emerging COVID-19 pandemic in 2020.

COVID-19 has had an impact on the global economy at a macro level, as well as at an individual household level. Korea is not an exception, though to a lesser extent. The country had enjoyed an average of 2.8 percent economic growth over the last five years before the pandemic. Korea's economic contraction in 2020 was recorded as decline in real GDP of 1 percent, which was smaller than in most countries, including the the United Kingdom (UK) (-9.4 percent), India (-7.3 percent), South Africa (-6.4 percent), Thailand (-6.1 percent), Malaysia (-5.6 percent), Japan (-4.5 percent), the United States (US) (-3.4 percent), and the world (-3.1percent) (IMF 2022). Korea's outstanding economic performance can be attributed to its sound macroeconomic fundamentals, a timely and effective public health response, and the deployment of a comprehensive set of fiscal, monetary, and financial measures (IMF 2021). For instance, the Korean government allocated a budget to manage the public health crisis and minimize socioeconomic damage, as compensation for medical services was funded by the national health insurance. Despite high volatility in the stock market and rising real estate prices, foreign exchange rates and consumer prices maintained stability. The social distancing policy carried out instead of lockdown mandates enabled continuous production and business activities with the support of relief funds. These factors, with government support, stimulated innovation and boosted corporate productivity.

Figure 2: 1980–2026 GDP growth rate and historical events in Korea

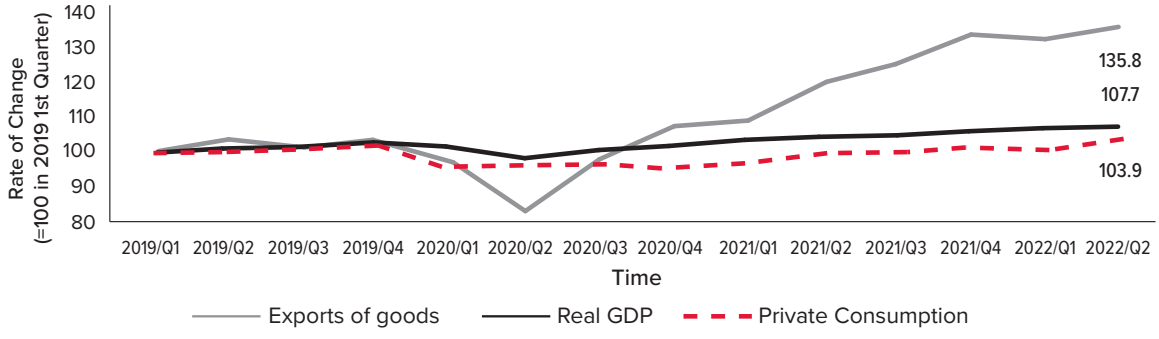


Note: Actual values until 2022 and forecasts after that
Source: IMF (2022)

Like in other advanced countries, the Korean government's fiscal policy has maintained an expansionary stance to cushion the economic effects of the pandemic. Various measures targeted to the most affected households, workers, and small and medium-sized enterprises (SMEs) were implemented. Since the outbreak of the pandemic, emergency disaster relief funds and customized economic support have been provided several times. These substantial COVID-19 response measures resulted in the overall fiscal deficit for 2020 widening to an estimated 4.1 percent of GDP (IMF 2021). Both central and local governments employed fiscal interventions, differentiated by the target population. Although these interventions seem to have had a positive impact on retail sales (Kim, Kim, and Shim 2021) and on financial protection for the vulnerable (Lee and Lee 2021), their effectiveness and any unexpected outcomes need to be evaluated further.

The social distancing policy has had pros and cons for the economic recovery. Economic activity, particularly export of high-tech products, recovered shortly after the second quarter of 2020 as the business cycle and international trade were maintained (figure 3). However, private consumption continued to struggle through the year (IMF 2021). This was because the households and employees were affected by measures such as telework, the business curfew, prohibition of large-scale events, and restriction of public gatherings. The rates of service activity, private consumption, and employment became even smaller in the last quarter of 2020 as compared to the second quarter of 2020, reflecting the highly contagious nature of COVID-19 (KIET 2021). A relatively better economic performance of Korea can also be attributed to its advanced information technology (IT) industry. A study found that the IT industry's having a larger share of the GDP alleviated the impact of COVID-19 on the economy; while the share of the services industry aggravated its impact (KIET 2021).

Figure 3: Quarterly impact of COVID-19 on the Korean economy (2019–2021)

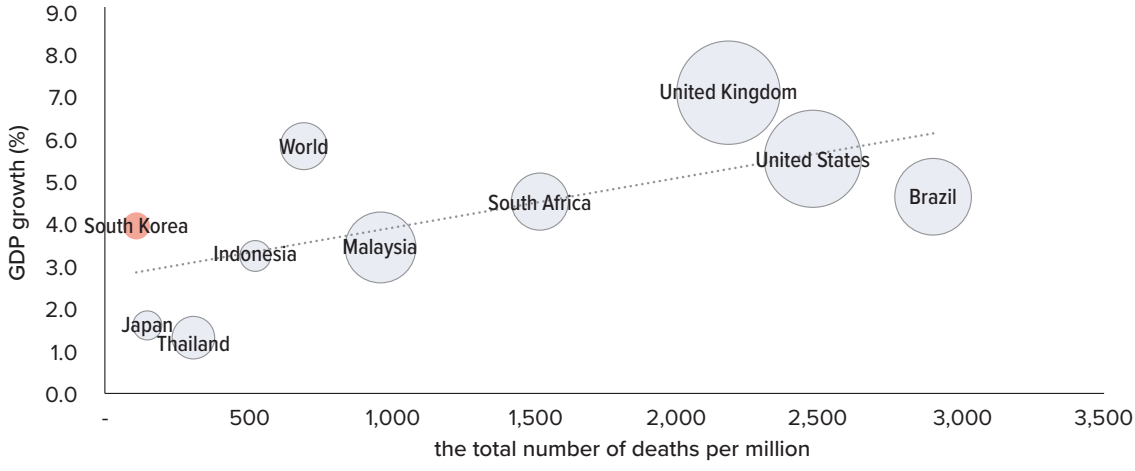


Source: Bank of Korea (2021)

A traveler wearing a face mask in a subway station

The second year (2021) of the pandemic saw new challenges such as vaccine rollout, new variants, and breakthrough infection across the world. Also, countries were beginning to diverge in terms of the ratio of cases and deaths to population (figure 4). At that time, Korea and other countries in the East Asia and Pacific (EAP) region had managed to keep the percentage of confirmed cases and deaths among the population as low as possible. Therefore, the government carefully headed toward the gradual lifting of infection control strategies, rather than giving up infection control instantly or withdrawing all public measures at once. The challenge in Korea in finding an acceptable balance between risk to health and economic impact will likely continue.

Figure 4: Total cases of and deaths from COVID-19 and the quarterly GDP growth rate in Q3 2021



Note: The bubble size indicates the total number of confirmed cases per million
Sources: Mathieu et al. (2020), OECD (2021c), IMF (2022)

Night view of Gangnam district in Seoul

2. METHODOLOGY AND DATA SOURCES

This case study aims to describe Korea's preparedness and response to, including the linked impact of, the pandemic on the health of the population and economy. However, because it is difficult to find a causal relationship between preparedness and response to the pandemic and its consequences, the case study has used a variety of available data. The sources of data include: existing literature, including research articles published in peer-reviewed journals; government reports; the legal framework and official regulations; primary data on the reported number of COVID-19 cases and vaccination, including expert opinion on the data; and results of surveys carried out by the Graduate School of Public Health, Seoul National University, and others, during the pandemic.

Given that the major issues and political agendas of the COVID-19 pandemic vary by time and country, updated information is an important area from which to draw lessons and policy implications. For this case study, we sought to collect, to the extent possible, the latest data on social distancing policies, vaccination rollouts, and health care coverage. For some topics, such as water, sanitation, and hygiene (WASH), an area that has not been discussed much in the Korean context, and the recovery of education within a year, the case study focused on key issues and policy measures at the early stage of the pandemic.

Bukchon Hanok Village (Korean traditional village) in Seoul

3. PREPAREDNESS

3.1 Policy and governance for disease surveillance and preparedness

3.1.1 Organizational structure

Korea has a centralized system for infectious disease control. As an agency of the central government, the Ministry of Health and Welfare (MOHW) plays a central role in health planning, policy formulation, and policy implementation at the national level. In addition to directly managing several national hospitals including psychiatric and tuberculosis hospitals, the MOHW implements various public health policies through collaboration with local governments.

At a metropolitan and provincial level, regional governments take responsibility for managing Regional Medical Centers and creating their own plans to build new hospitals for their residents. Through its Public Health Centers, each municipality also provides various public health services, including antenatal care, vaccination, health checkup, and basic medical care (Kwon et al. 2015).

In the COVID-19 health emergency, coordination between central and local governments was essential to quickly increase the government's response capacity. The importance of coordination between central and local governments was a lesson learned from the May 2015 MERS outbreak, which had resulted in 186 confirmed cases and 38 deaths. At that time, the government was criticized for its failure to provide the general public with timely and transparent information, and a lack of coordination between central and local governments was seen as delaying a timely and prompt response (Kwon et al. 2020, Yang et al. 2021).

Along with the MOHW, the Korea Disease Control and Prevention Agency (KDCA) plays a key role in managing infectious diseases like COVID-19. Its predecessor, the Korea Centers for Disease Control and Prevention (KCDC) provided technical support on the control and prevention of communicable and noncommunicable diseases. Specifically, the agency's functions include investigating diseases, handling quarantine, overseeing and performing laboratory testing, and conducting research to support policy formulation and implementation at the national level (Kwon et al. 2020).

Expanded from the former Korea National Institute of Health, the KCDC was formally established by the government in 2004, when Korea successfully prevented any incidence of SARS, despite the outbreak in the region. The KCDC was formed as a major agency in charge of national disease control and prevention. In 2016, the KCDC was promoted to the level of vice-ministry, with strengthened organizational capacity after the MERS outbreak. This organizational change included creating new departments such as the Emergency Operations Center, Risk Communication department, and Infectious Disease Diagnosis and Control department. The KCDC had only been a special agency under the MOHW before the pandemic. Recognizing its importance in controlling and preventing COVID-19, on September 12, 2020, the government raised the status of the KCDC to that of an independent governmental agency called the KDCA, with autonomy for managing personnel and budgetary decisions.

3.1.2 Legal framework

The Framework Act on the Management of Disasters and Safety, enacted in 2004 for the operation of an integrated disaster management system, has been the basic law for disaster management in Korea (MOEF 2020). This Act applies to natural disasters and social accidents, including damage caused by the spread of infectious diseases.

The Infectious Disease Control and Prevention Act (IDCPA) is the major law dealing with infectious diseases in Korea. During the outbreak of MERS in 2015, however, a few problems with this law were revealed: it did not designate the specific roles of each level of government and did not highlight the importance of coordination between central and local governments (Park 2017).

After the outbreak of MERS ended, the IDCPA was revised in the following areas:

1. To respond to health emergencies more rapidly and effectively, requisite power was given to the central government (the MOHW and KCDC) to make the top-down approach possible during emergencies.
2. The KCDC's authority was elevated, and more funding and personnel provided. For example, more epidemiologists, who are seen as vital to increasing the capacity for infectious disease control and pandemic preparedness, were hired (Kwon et al. 2020; Yoo et al. 2021).
3. Extensive contact tracing was enabled in the case of public health emergencies. For example, the revision allowed the MOHW to request and collect information on closed-circuit television (CCTV) footage and locations of confirmed patients and potential patients, from the Korean National Police Agency and telecommunications companies—with the provision that collected information must be destroyed when the relevant task for managing the outbreak is accomplished. The law also mandated that the government disclose information to the public about paths (whereabouts) of confirmed cases to ensure the public's right to know (Kwon et al. 2020). Thus, the revised IDCPA was given authority to override certain privacy law provisions in case of an outbreak of a serious infectious disease (Park et al. 2020). Considering its impact on the public, the law was further revised in March 2020, to improve the process of information gathering and disclosure, allowing a patient to appeal for amendment, if disclosed information is inaccurate.
4. Based on the experience with the outbreak of MERS, a new regulation on the prohibition of false representation was included in the IDCPA. In other words, the law prohibits anyone from making a false statement on the information on health care utilization, which is necessary to confirm one's infection, if the level of alert was 2 (yellow, caution) or above during the outbreak of infectious diseases.
5. A new provision was included allowing employers or governments to compensate employees or the self-employed for treatment, or while they are under mandatory self-quarantine, due to outbreak of an infectious disease. The revised law also mandated that the government provide compensation to hospitals that incur loss due to the treatment of patients with infectious diseases or of those with suspicious symptoms (Kwon et al. 2020).
6. The IDCPA was further revised in March 2020 to promptly respond to COVID-19. The revision included a fine for individuals with suspected cases who refused testing, and it increased the fine for those who did not comply with the quarantine order. The government was also mandated to provide masks for vulnerable populations at an affordable price in case of a health emergency, and to place a temporary ban on the export of critical medicines and medical supplies to ensure adequate stockpile and prevent shortages. The law also increased the minimum number of epidemiological investigators in the KCDC from 30 to 100 (Kwon et al. 2020).

3.1.3 Control mechanism

Korea's National Infectious Disease Risk Alert System has four levels of crisis alert in ascending order: blue (level 1, attention), yellow (level 2, caution), orange (level 3, warning), and red (level 4, serious). The MOHW has the authority to issue and adjust the risk alert. Depending on the level of alert, different governmental agencies are involved: levels 1 and 2 are controlled by the KDCA, and levels 3 and 4 by the Central Disaster and Safety Countermeasures Headquarters (CDSCHQ), with recommendations of the KDCA.

Specifically, at level 1, countermeasure teams are organized at the KDCA according to types of infectious diseases. At level 2, the Central Disease Control Headquarters (CDCH) at the KDCA is formed and operated. At level 3, the Central Disaster Management Headquarters (CDMH) is launched to support the CDCH, and at level 4, pan government response measures through the CDSCHQ are activated (Republic of Korea 2020). Table 1 shows the infectious disease risk alert system and countermeasure activities depending on the level of alert.

Table 1: 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	
Attention (Blue)	Novel infectious disease emerges overseas and becomes an epidemic.	Unknown/ re-emergence of domestic infectious disease	• Countermeasure 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.
Caution (Yellow)	Novel infectious disease enters Korea.	Limited transmission of the unknown/ re-emerging domestic infectious disease	• 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.
Warning (Orange)	Limited transmission is detected for novel infectious diseases in Korea.	Community transmission of unknown/ re-emerging domestic infectious disease	• 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 pangovernmental meeting. • The Ministry of Interior and Safety reviews operation of pangovernmental support headquarters. • Cooperation mechanisms for relevant agencies are strengthened. • Disease prevention and surveillance activities are enhanced.
Serious (Red)	Community transmission or nationwide spread is observed for novel infectious disease in Korea.	Nationwide spread of unknown/ re-emerging domestic infectious disease	• Full-capacity and pangovernmental response are in place. • If needed, Central Disaster and Safety Countermeasure Headquarters begins its operation.

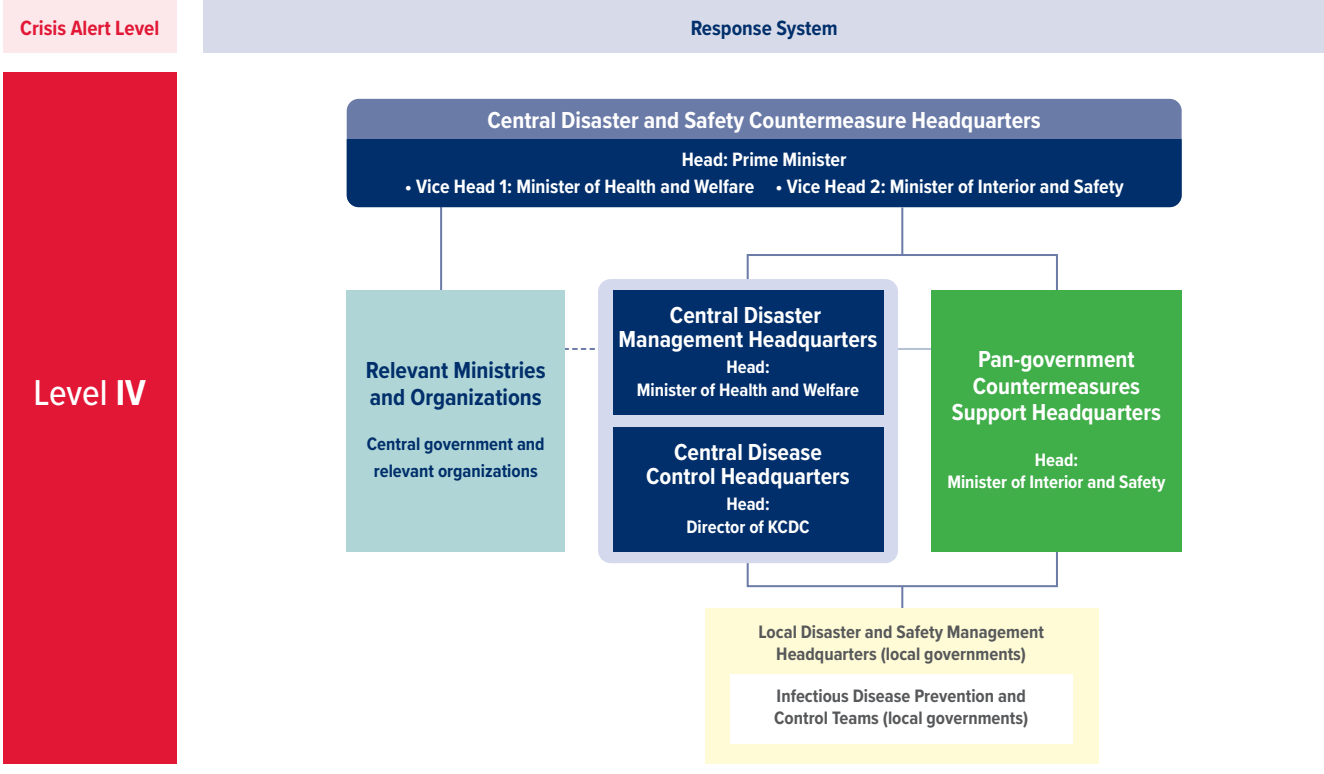
Source: Republic of Korea (2020)

In the case of COVID-19, alert level 1 was issued on January 3, 2020, soon after a cluster of cases of pneumonia of unknown origin was reported by the China National Health Commission on December 30, 2019. The first confirmed case in Korea on January 19 led to immediate issuance of alert level 2 on January 20, while the outbreak in Shincheonji Church and the first COVID-19-related death led to the alert level being raised to level 4 on February 23, 2020.

Figure 5 shows the response system of the Korean government when the level of alert is highest (red, serious). The CDSCHQ, headed by the prime minister, was launched. The final decisions were made in the CDSCHQ, led by the prime minister, while the KCDC (in its role as the CDCH and control tower) provided key technical information as a vital input to those decisions (Kwon et al. 2020).

The MOHW is the first vice head for CDSCHQ and the director of the CDMH. The minister of interior and safety is the second vice head of CDSCHQ and the director of the government-wide Support Center, tasked with providing necessary assistance, including coordination between the central and local governments for allocation of patients across public hospitals in different localities. Each local government also establishes its Local Disaster and Safety Countermeasures Headquarters, directed by the head of the local government, which ensures availability of hospitals dedicated to infected patients. The central government provides support for hospital beds, workforce, and other supplies when local governments face shortages (Kwon et al. 2020). Table 2 shows cooperation among governmental agencies in infectious disease crises. The pangovernment crisis response system is aimed at preventing confusion in the field through sharing of roles among governmental agencies.

Figure 5: Response system in the serious crisis stage



Source: MOHW (2020a)

Table 2: Cooperation in Infectious Disease Crises

Central Government	MOHW	• Consolidate and coordinate policies on infectious diseases and revise the Infectious Diseases Control and Prevention Act
	KCDC	• Plan and coordinate for infectious disease control • Collect, report, and analyze the information related to infectious diseases • Early detection and identification of infectious diseases • Conduct a national standard experiment on infectious disease pathogens and establish a standard test method • Prevent the spread of infectious diseases • Rapid diagnosis and treatment of infectious diseases
	National Quarantine Service (NQS)	• Execute entrance quarantine from infection-contaminated area • Conduct a quarantine inspection (dynamic investigation) of a suspected case in the quarantine phase and transfer of suspected patients. • Notify the city or province of those subject to follow-up monitoring, those suspected of being infected at the quarantine stage. and those in contact
Local government	City or province	• Establish and coordinate plans for the management of infectious diseases in cities and provinces • Promote and educate for infectious disease prevention and management in cities and provinces • Identify the occurrence and prevalence of statutory infectious diseases in cities and provinces • Analyze infectious disease data and information in cities and provinces • Organize and operate a city/province epidemiological investigation team • Receive and report the outbreak of infectious diseases • Establish a public-private cooperation system in the local community
	Research Institute of Public Health and Environment (RIPHE)	• Inspect and monitor infectious disease pathogens in cities and provinces • Educate and train the inspection methods in city, county, and district health centers • Analyze infectious disease pathogens in the community
Health care facility		• Diagnose and report patients with (suspected) infectious diseases • Cooperate for epidemiological investigation and infectious disease management in the event of an infectious disease (suspected) patient

Sources: KCDC (2020), MOEF (2020)

The government has expanded the benefits package to reduce the financial burden of patients.

3.2 Health system

3.2.1 Health financing

The National Health Insurance (NHI) is the major financing mechanism for health care in Korea. With mandatory enrollment, the NHI covers almost all Koreans, except those who are eligible for the tax-funded Medical Aid Program, which provides the same benefits as the NHI but subsidizes contribution and copayments. The NHI's contribution rate is determined annually, based on its fiscal condition during the previous year. The NHI contribution for employees is based on his or her payroll, with a contribution rate of 6.86 percent of wages in 2021, which is shared equally by the employer and employee. The contribution for self-employment insurance is set based on the information of the household's income and ability-to-pay (for example, for property and cars), as a proxy.

Benefits packages in the NHI include most health care provided by health care institutions, covering diagnosis, tests, medical materials and medicines, treatments, surgeries, preventive care, rehabilitation, hospitalization, dental care, and traditional medical care. Co-insurance rates are 20 percent of the total cost for inpatient care and 30 to 60 percent for outpatient care. As for outpatient care, lower co-insurance for less-expensive, smaller-sized medical institutions applies to incentivize more use of them—for example, 30 percent for clinics, 40 percent for hospitals, 50 percent for general hospitals, and 60 percent of treatment cost and per-visit consultation fee for tertiary hospitals.

The government has expanded the benefits package to reduce the financial burden of patients. For example, the co-insurance rate was lowered from 20 percent to 5 percent for patients with catastrophic illnesses such as cancer. There are also ceilings on (annually cumulative) out-of-pocket (OOP) payments, beyond which patients are exempted from cost sharing and the National Health Insurance Service (NHIS) foots the bill for the services covered by NHI. Despite these efforts to reduce the financial burden of patients, the OOP payment is still very high. As of 2019, about 64.2 percent of total health care cost is covered by NHI and the remaining is OOP expenses paid by the patients. This is partly because health expenditure for noncovered services, paid solely through OOP, has kept increasing.

Mandatory NHI contribution can be discounted for those meeting certain conditions. This was true of those heavily affected by COVID-19. For three months (March to May 2020), 50 percent of contributions were discounted for those in the bottom 20 percent income percentile of the insured, and a 30 percent discount was applied to the next lowest—20 to 40 percent—income percentile (Kwon et al. 2020).

According to the IDCPA, most costs for testing and treating infectious diseases such as COVID-19 are covered by either the government or the NHI (Kwon et al. 2020). In other words, there is no financial burden on patients for the tests and treatment of COVID-19. as they are exempt from cost sharing for communicable diseases, which the government is mandated to fund.

3.2.2 Health service delivery

Health care benefits can be delivered by all levels of health care institutions such as clinics, hospitals, and general hospitals; tertiary hospitals require patients to present a referral slip issued by a medical doctor. When receiving medical treatment against the care delivery process, the patient must pay the entire expense of health care benefits, which means the co-insurance rate is 100 percent of total expenses, according to Article 10 of the enforcement regulations of the National Health Insurance Act. However, the requirement of referral slips has played a scanty role in gatekeeping in the care delivery system. Patients can choose any practitioner, even a tertiary hospital, if they have minor symptoms, if they pay higher co-insurance or even the entire expense.

Medical services are supplied mainly by private providers, with public hospitals representing 5.5 percent (221 out of 4,028) of the number of hospitals and 9.7 percent (62,240 out of 641,891) of the number of hospital beds in 2019 (KOSIS 2021c). Since the introduction of social health insurance in 1977, it has been mandatory for all private providers to treat patients subsidized by the NHI.

There is a public network of primary health care facilities, including health centers, health subcenters, and primary health care posts operating with the purpose of filling gaps in private provision in underserved areas. They provide public health services and basic ambulatory services, including prevention and health promotion, vaccination, and management of communicable diseases. As of 2019, there were 256 health centers, 1,340 health subcenters and 1,904 primary health care posts in Korea (KOSIS 2021b).

Telemedicine had not been introduced in Korea prior to the pandemic, mainly because of the opposition of the Korean Medical Association (KMA), which was worried that telemedicine would increase the market share of big hospitals at the expense of physician clinics in the community (Kwon et al. 2020).

3.2.3 Physical infrastructure and workforce capacity

After the MERS outbreak, the necessity of having specialized infectious disease hospitals to meet the need of any outbreak of new types of infectious diseases was recognized. This is because it is very important to separately accommodate and manage patients infected with the new organism until vaccines or medicines for treatment become available. In 2017, the Korean government announced a plan to designate three to five general hospitals or tertiary hospitals as specialized regional infectious disease hospitals, each of which must have at least 36 negative pressure isolation rooms. This plan is being implemented currently. Apart from this, state-designated hospital beds were under operation for isolating and treating patients in case of public health emergency. As of 2019, there were 161 negative pressure isolation rooms (198 beds) that were state designated, whereas public and private hospitals operated 755 negative pressure isolation rooms (1,027 beds) (D. H. Kim 2020).

Although doctors and nurses used personal protective equipment (PPE) during the Korean MERS epidemic, some were infected with Middle East respiratory syndrome–related coronavirus (MERS-CoV), which was attributed to inadequate use of PPE. Therefore, since then, the MOHW/KCDC, local governments, and medical professional associations have provided regular training on the use of PPE to doctors, nurses, and other medical professionals on the front lines. In addition, a separate training on public health emergency response for senior managers in local governments has been carried out since 2016 (Kwon et al. 2020).

People wearing face masks

Night view of Gangnam district in Seoul

4. RESPONSE

4.1 Governmental response to contain COVID-19

4.1.1 Lockdown, travel restriction, quarantine

As a neighboring country to China, Korea had to suffer from a surge of confirmed COVID-19 cases at the beginning of the outbreak, especially when the large Shincheonji Church outbreak occurred in the Daegu-Gyeongbuk region on February 18, 2020. As of March 30, 2020, 82 percent of all confirmed cases in Korea were residents of the Daegu-Gyeongbuk region, and 58.7 percent of them were linked to the Shincheonji Church (Republic of Korea 2020).

There was a debate regarding lockdown and travel restrictions—whether travel restrictions should be placed on all of China and a lockdown implemented on the Daegu-Gyeongbuk region. Korea did not implement draconian lockdown measures, instead choosing only to prohibit the entry of foreign nationals from Hubei Province in China, where the first COVID-19 outbreak was reported. Once the situation improved in Hubei Province, this prohibition was retracted on August 10, 2020 (Republic of Korea 2020).

Additionally, starting on February 4, the Korean government implemented the special entry procedure for every traveler from China, gradually expanding the procedure to travelers from other countries reporting a high incidence and, eventually, to travelers from all parts of the world from March 19 onwards, after the World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020.

The special entry procedure aimed to effectively block the spread of COVID-19 in the country through the early detection of confirmed cases among inbound travelers during their entry screening. Starting on March 19, all inbound travelers were required to provide the addresses of the places where they would be staying, with their contact phone numbers, on arrival, and to install the Self-Check Mobile App for continuous monitoring of possible symptoms, so they could be quarantined and treated in a timely manner, if necessary (Republic of Korea 2020).

Starting April 1, mandatory COVID-19 testing and a 14-day quarantine for all inbound travelers were introduced. Short-term visitors who did not have a place of residence in Korea for self-quarantining were provided places to stay by the Korean government, and the travelers were required to pay the related expenses (1.4 million Korean Republic won (KRW or ₩), or US$1,203 equivalent per person, for 14 days). Korean nationals with a place of residence in Korea and foreigners with long-term stay status were allowed to be quarantined in their place of residence (Republic of Korea 2020).

Disinfecting of public toilet to prevent COVID-19

In addition, country-specific restrictions, such as the temporary suspension of visa issuance and requirement of a negative polymerase chain reaction (PCR) test result for issuing Korea-bound flight tickets, were introduced in late June in response to a sharp rise in COVID-19 infections among inbound travelers from a select number of countries (Republic of Korea 2020). As of May 2022, the requirement of a negative PCR test result has been maintained with minor adjustments. Only a few exceptions were allowed: for flight attendants, Korean nationals within 40 days from the date of a positive test confirmation, or those holding an exemption letter for an official business trip. After arrival, self-quarantine and additional PCR tests have been required, depending on vaccination status and COVID-19 prevalence. Since social distancing rules were lifted in 2022, the government has been gradually relaxing quarantine regulations for international travelers.

4.1.2 Testing, contact tracing, isolation

As an immediate response to the COVID-19 outbreak, the Korean government relied on extensive rapid testing and contact tracing combined with social distancing, rather than draconian lockdowns. This strategy of testing, contact tracing, and isolation represented the government's will to contain the outbreak to the greatest extent by finding suspected or confirmed cases as early as possible. This strategy was maintained and was successful throughout the first year of the pandemic, which could be attributable to several factors.

At a very early stage, the KCDC cooperated with the private sector to develop test kits. The real-time (RT)-PCR kit, developed by Korea, can diagnose a positive case within an average of six hours, which is a vast improvement compared to the previous diagnostic test, which took one to two days to confirm the cases. Emergency Use Authorization (EUA) also accelerated market access and mass-scale production of the test kit. EUA is a system through which the Ministry of Food and Drug Safety, the Korean equivalent of the US Food and Drug Administration (FDA), accelerates approval for the reagents requested by the KCDC if there are insufficient or no domestic licensed products (MOEF 2020). EUA reduced the time for approving the marketing of products from 80 days to two or three weeks, in some cases even as little as seven days. In the case of the first test kit for COVID-19, the EUA was activated on January 28 and its use was approved on February 4 (APO 2020). Due to the early development and mass-scale production of this test kit, testing capacity in Korea improved to the greatest extent.

More than 600 COVID-19 test centers were established in public health centers and hospitals, both public and private, in February 2020. In addition, "drive-thru and walk-thru" screening clinics were introduced to meet the extensive testing demands by collecting samples faster than in the traditional setting. For example, these clinics reduced the specimen collection time to 10 minutes, three times faster than a regular screening center (APO 2020). Apart from efficiency in sampling, "drive-thru" screening centers are known to be safe because they

avoid further potential transmission of virus, while "walk-thru" screening centers are convenient to visit as they are established in convenient locations, such as station plazas, to make testing easily accessible to citizens.

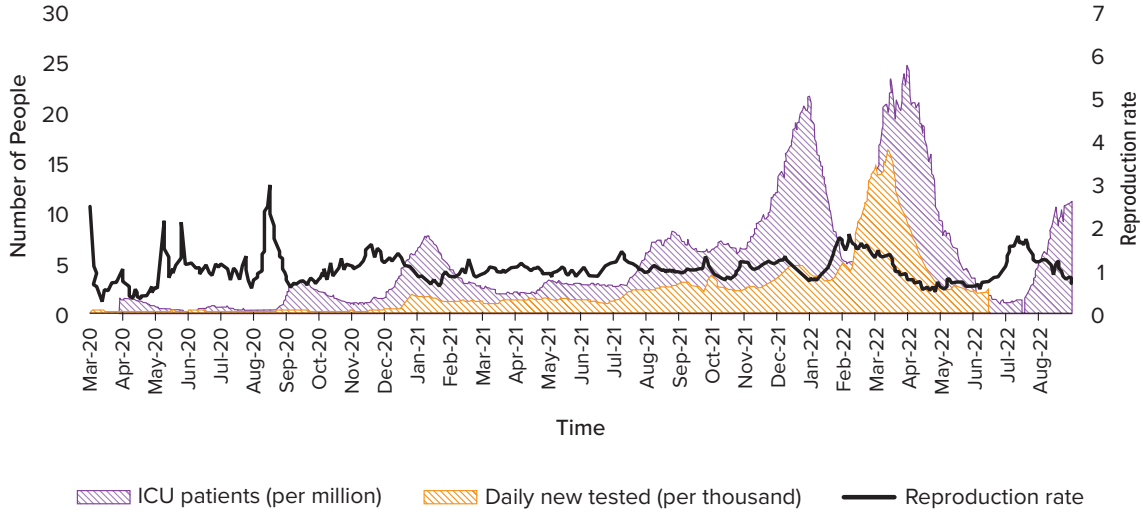
The price of a diagnostic test is about ₩80,000, with a price difference of ₩10,000 by type of medical institution; the highest price is approximately equivalent to $100. The test has been free of charge for those having symptoms and for confirmed or suspected cases. All health care workers and hospitalized patients also have had diagnostic tests for free, to prevent nosocomial infection. All hospitals conducting the diagnostic tests can receive reimbursements from the NHIS after the Health Insurance Review and Assessment Service (HIRA) reviews their claims.

If patients with other illnesses are about to be hospitalized, the diagnostic test is mandated for a fee. In this case, the diagnostic test with a pooling method is used, costing ₩10,000 at first, with additional costs of ₩20,000 if the pooled test result is positive. If patients refuse the pooling method, they must receive a standard diagnostic test costing ₩80,000 as a 100 percent OOP payment. Other medical expenses for unnecessary or extra tests, such as X-rays or blood tests, were are charged as usual, depending on the indication.

In principle, the testing fee was charged only for those who requested the test without symptoms or without high risks. However, medical providers often did not charge the testing fee, as proactive testing was encouraged in temporary screening clinics, and hospitals claimed full compensation for testing costs to the NHIS. The government further allowed free testing for asymptomatic cases in a condition of level 2 or higher who were in social distancing from December 2020, and at all screening centers run by local governments from April 2021.

With financial arrangements for medical supplies and staffing recruitment, the testing capacity continued growing, from tens of thousands in 2020, to hundreds of thousands in 2021 (Republic of Korea 2021). The total number of daily diagnostic tests has been growing steadily since May 2021 with the relaxation of policy measures in social distancing. Epidemiological investigation has been maintained, even during the surge of the Delta variant, to monitor the severity of community transmission and engage the public in early detection and treatment. Despite the response of the system, the intensive care unit (ICU) capacity was tightened, with overwhelming patient inflow. In preparation for the advent of the Omicron variant during the winter, the government rearranged the epidemiological investigation standard, priority, and supply chain. Figure 6 shows the testing and treatment capacity against COVID-19 with stabilized reproduction rate.

Figure 6: Trends of testing and treatment against COVID-19 in the Republic of Korea



Source: Mathieu et al. (2020)

Korea has relied heavily on extensive contact tracing since the outbreak of the pandemic. Once a patient tests positive for COVID-19, epidemic intelligence service (EIS) officers from the KDCA and/or provincial and local health authorities conduct an epidemiological investigation to trace the source of the infection, with all routes traced to identify where and when the patient visited. For extensive and rapid contact tracing, various tools are used together, such as interview data from confirmed cases, credit card transactions, CCTV footage, mobile Global Positioning System (GPS) data, and medical records (APO 2020).

The persons identified through the epidemiological investigation as having had a close contact with confirmed cases are asked to stay in self-quarantine for 14 days, and to have their symptoms monitored with the Self-Quarantine Safety Protection App. Through the app, active monitoring is conducted by assigned officers who monitor symptoms twice a day and are alerted when self-quarantine orders are broken, through the app's GPS-based location tracking (APO 2020). For all those who were in the place where the confirmed case visited at a similar time, text messages are sent to ask them to get tested at the nearest screening centers. To strengthen contact tracing, since June 10, 2020, all visitors to high-risk facilities have been requested either to present a personal QR code or leave a handwritten log. However, it should be acknowledged that Korea's approach to data collection, surveillance, and contact tracing may not be replicable in many other settings with different personal data protection laws (Yoo et al. 2021).

The extensive testing and contact tracing needs to be followed by isolation of those identified as suspected or confirmed cases—hence the importance of having adequate and appropriate facilities for managing them. The government adopted a tiered system to separate the sick from the healthy (Yoo et al. 2021). Patients with mild symptoms were sent to a Community Treatment Center (CTC) where their symptoms were monitored, whereas those with severe symptoms were sent to hospitals designated for the treatment of COVID-19. Asymptotic cases were asked to self-quarantine at home.

4.1.3 Risk communication and information disclosure

When an outbreak emerges, communication helps inform and calm the public by providing timely and accurate risk information, delivering response manuals to health care workers, and facilitating understanding of the behavioral recommendations and their quick implementation by the public.

During the COVID-19 outbreak, two control towers were involved in crisis and risk communication: Central Disease Control Headquarters (CDCH) under the KDCA and Central Disaster Management Headquarters (CDMH) under the MOHW. Both centers have a team or a unit whose key role is public relations (PR). Primarily, five types of PR activities were required: (i) prepare relevant data and information for daily press release and briefing; (ii) respond to false information in the conventional and social media; (iii) disseminate video, infographic, or text messages online and in the local community and general public; (iv) conduct expert group committee meetings when necessary; and (v) conduct public surveys and large-scale campaigns to promote public awareness and engagement.

The Korean central and local governments have taken various measures to disclose real-time information to alert individuals to the risk of viral transmission, as well as inform them on how to reduce the risk. On January 20, 2020, the breaking news was aired with an emergency briefing by the chief director of the KCDC (currently the commissioner of KDCA) on the identification of the first confirmed case of COVID-19. Since then, the CDCH and CDMH have disseminated the following four types of information to the public daily:

1. Diagnostic information—epidemiological and clinical information, aiming to help citizens identify the current status of COVID-19 through the following data:
    - daily numbers of new infections, including both domestic infections and those from abroad;
    - daily numbers of those in quarantine, released from quarantine, and under treatment (including severe conditions), and of deaths;
    - characteristics of infection clusters—for example, the number of infections collected from religious institutions, clubs and bars, private education facilities, long-term care facilities, and so forth;

A man measuring body temperature at a screening clinic

- updated information on risk such as the basic reproduction number (R0), which indicates the transmission rate of the viral infection; and
- cumulative number of confirmed cases and deaths.

2. Prognostic information—informing the public on how to reduce the possibility of contracting the coronavirus and how to reduce negative consequences of the infection, through the following:

- key guidelines on preventive behavior and social distancing recommended by public health authorities (KDCA, MOHW) and expert groups;
- detailed information on how to get COVID-19 testing and treatment; specifically, the location of the public health centers for the test and patient treatment; and
- updated data on the effectiveness of compliance with guidelines in reducing the risk of getting infected; for example, the importance of wearing a face mask when a mass infection occurs.

3. Policy-related information, updated to contain infection transmission and to support the affected populations, on the following:

- level of stringent social distancing measures, including duration and types of applied rules and penalties;
- financial and other support for the affected population—for example, emergency disaster relief funds; and
- decisions regarding COVID-19 responses, such as quarantine reduction from 14 days to 10 days, or changed rules for quarantining at the airport.

4. Information disclosure on routes obtained from contact tracing investigations of confirmed patients. In Korea, by law, information from the use of credit cards and mobile telecommunication, as well as self-reports from the patients, can be used for contact tracing. In the early stage of the outbreak, disclosed information included:

- socio-demographic information—age, gender, location of residence, name of workplace, date of being confirmed, and other data; and
- routes—places visited by confirmed patients, time, and means of transportation used.

Although the information was initially considered to increase citizen awareness on avoiding infection risk through self-quarantine and to stop the spread of infection by early testing, there has been an increasing social concern and public debate on the scope of information disclosure, both in terms of protecting patient rights and the epidemiological effectiveness. The disclosed routes were often used to blame the patient and resulted in victimization. A substantial number of individuals and businesses suffered, not only from economic losses due to shops closing just because a patient visited the place once—even though disinfection had been completed—but also from stigma such as “a contaminated region and place” or “a potential carrier of the viruses.” As a response, the Korean government revised the Act in October 2020, limiting the scope of information disclosure only to include data such as time and date with epidemiologically relevant movement history. Information that could be used to identify the patient, such as age, gender, nationality, residence location, and name of workplace, was excluded.

The act addresses a wide range of roles and responsibilities of the central and local governments in disaster and safety management. For public communication, there is a new regulation dictating that mobile and telecommunication industries cooperate with governments when necessary to forecast, alert, and notify emergency measures. Since the beginning of the outbreak, local governments have actively sent emergency alert messages to their citizens, providing:

- epidemiological information; for example, on new infection clusters in their community, including contact tracing information (routes taken by the confirmed cases);
- information on where and when disinfection or temporary facility closure will happen;

The WHO has defined an infodemic as a condition of too much information, including false or misleading information, in an outbreak.

- summary of the level of stringent social distancing, as well as related administrative interventions;
- requests to identified contacts of the confirmed cases to get themselves tested; and
- key campaigns and events, such as appreciation for health care workers.

The WHO has defined an infodemic as a condition of too much information, including false or misleading information, in an outbreak. Concerns have been raised about the infodemics in Korea. The government provided a formal dedicated information portal with micro-web pages on COVID-19, helpline call numbers, email accounts, and other social networking service (SNS) channels in order to facilitate public access to and use of relevant information. Korea's news media also increased efforts to protect news consumers from being vulnerable to fake news and incorrect information by operating a "fact-check" section during the news release.

4.2 Health system response

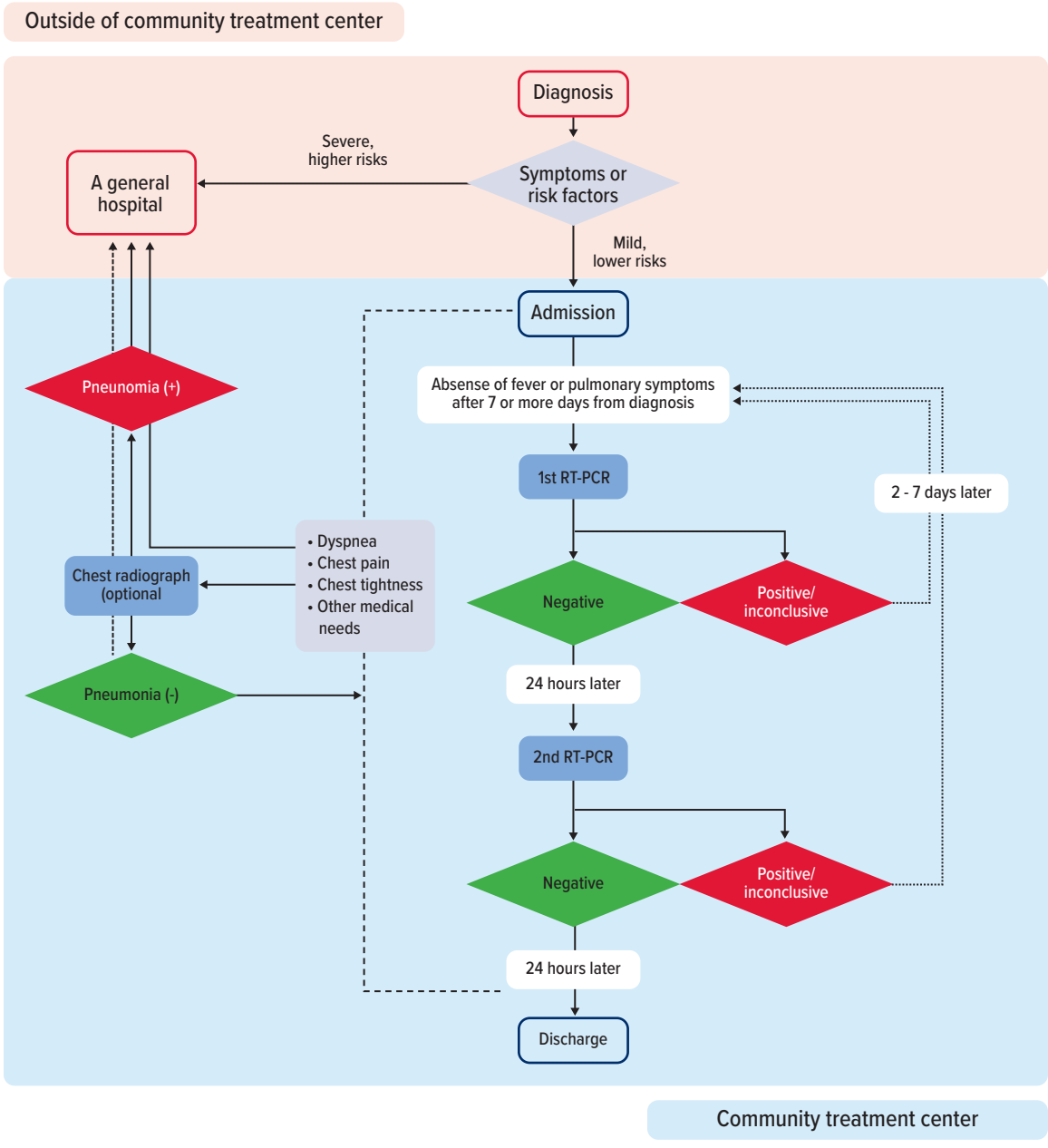
4.2.1 Primary care and hospital response

In case of an outbreak or a pandemic, the health system's response is very important in reducing the case fatality. The quantum of burden on a health system's capacity is closely related to the case fatality rate. At an early stage of the pandemic, a surge in confirmed cases in the Daegu-Gyeongbuk area led to a temporary shortage in hospital beds. Until March 8, 2020, eight (15.7 percent) of the 51 deaths across the country occurred during the wait for hospitalization, either at home or during transfer from home to health care institutions (Son et al. 2021).

Faced with a rapidly increasing number of confirmed cases, the government focused on reducing the burden on the health systems. On March 1, 2020, the government published a guideline to classify confirmed cases into four categories: mild, moderate, severe, and very severe. Moderate, severe, and very severe patients were assigned to negative pressure isolation rooms (NPIRs), or hospitals dedicated to COVID-19 patients. Patients with mild symptoms were monitored in 16 community treatment centers (CTCs) where thousands of these patients could live separately and independently, with a close monitoring by a few medical staff residing in the facilities, or with a remote monitoring by higher-level health care institutions. To meet the conditions necessary for quarantine and self-isolation, dormitories, training centers, and hotels were used through voluntary participation and contracting.

Patients with mild symptoms were able to recover without putting their families and neighbors at risk of infection and were discharged when they tested negative, with two RT-PCR tests done at an interval of 24 hours (figure 7). The introduction of CTCs was at first influenced by societal pressure to provide hospital treatment for anyone having sickness. It also took a while to find out the characteristics of the SARS-CoV-2 transmission, and the fact that the illness could sometimes worsen even with mild or no symptoms initially. The existence of CTCs itself delivered a message to the public that there were medical resources distributed for the local communities and that blocking the infection route was top priority. It could be said that the patient classification system with CTCs suggested a new model of continuum of care for infection control that can alleviate the burden on hospitals during an accelerating outbreak or pandemic crisis.

Figure 7: Flow from diagnosis to the quarantine at a community treatment center in Korea



Source: W. S. Choi et al. (2020)

Patients with moderate-to-very-severe COVID-19 were hospitalized for treatment either in national, designated isolation units (NDIUs) or hospitals dedicated to infectious diseases. The NDIUs are hospitals equipped with negative pressure isolation rooms and other essential facilities capable of providing specialized treatment for infectious diseases. Patients with severe or very severe symptoms were hospitalized at these facilities (Republic of Korea 2020). NDIUs originated from the establishment of a negative pressure isolation ward at the National Medical Center during the 2006 regional SARS outbreak. Then, in 2009, when the swine influenza epidemic spread in Korea, the government revised the IDCPA to provide a legal basis. The 2015 MERS outbreak incurred revision of the Act to mandate any medical facilities having more than 300 beds to build negative pressure rooms. By the end of 2019, just before the onset of the pandemic, the numbers for NDIUs were 337 general beds and 198 negative pressure isolated beds at 29 hospitals nationwide (KCDC 2019). Hospitals dedicated to infectious diseases are medical facilities for the prevention and treatment of infectious diseases, recognized under the IDCPA. They re-allocated their hospital beds for the treatment of confirmed COVID-19 cases having moderate symptoms and requiring hospitalization (Republic of Korea 2020).

Along with some public hospitals providing care exclusively for COVID-19 patients, private health care providers have also played a key role in responding to COVID-19. However, the private sector was less willing to invest in special facilities for infectious diseases, such as negative pressure isolation rooms, not only because of the cost, but also due to concerns of losing non-COVID-19 patients. Therefore, the government has supported the additional costs at private hospitals, to secure those medical resources, and made up for the loss caused by reduced non-COVID-19 patients.

4.2.2 Human resources for health

The capacity for epidemiological investigation is very important to control an outbreak/pandemic. Insufficient capacity for epidemiological investigation was identified as problematic during the MERS outbreak. The IDPCA was revised to recruit at least 30 EIS officers at the KCDC (now KDCA) headquarters; two EIS officers in each of the local governments. Since the outbreak of COVID-19, the Act was revised again to increase the minimum number of EIS officers under the MOHW (now KDCA) to 100. EIS officers' positions are open to not only doctors but also to other medical professionals and public health specialists, who need to complete the Field Epidemiology Training Program (FETP). Due to the prolonged pandemic, the workload of EIS officers in charge of tracing and surveillance became tremendous. As their remuneration varied depending on the respective local governments, it was difficult to recruit and retain EIS officers in some cities and provinces. In 2021, the number of EIS officers was over the minimum requirement in the headquarters and provincial governments, while some municipal governments with less than 100,000 population struggled to fill their vacancies.

When the number of confirmed cases surged in the Daegu-Gyeongbuk area during the early phase of the pandemic, many health care professionals from other cities in both public and private sectors volunteered to cope with the situation. Two thousand three hundred and ninety-two health care workers were recruited from other regions, and 327 physicians volunteered for both public health and medical responses (J. Kim et al. 2020). Accordingly, the government published guidelines that included information about remuneration, lodging, and ex-post monitoring of the mobilized professionals (APO 2020). Regarding remuneration of the recruited health professionals, public sector doctors and nurses were paid ₩120,000 and ₩70,000, respectively; while those from private sectors were paid ₩450,000 to ₩550,000 and ₩300,000, respectively. Universal masking policy, aggressive use of PPE, and regular health care worker screening were used to minimize nosocomial transmissions. Although a total of 121 health care workers, including 14 doctors, 56 nurses, and 51 nurse aides, were infected in Daegu by March 24, 2020, their proportion to the total cases in Daegu was 1.8 percent—comparatively lower than in other global hot spots. For example, in Italy the corresponding figure was 9 percent of total cases during the same time period (J. Kim et al. 2020).

As the pandemic became prolonged, increasing numbers of health care workers experienced burnout. The recent fourth wave of the pandemic recorded shortages of health care workers in some cities and provinces. Despite having sufficient beds allocated for COVID-19 cases, all of them may not have been operational because of a shortfall of health professionals (Medigate 2021). Hence, those local governments experiencing a shortage of health manpower responded by recruiting new health care workers in the public sector two to three months ahead of the schedule.

A high school student getting a vaccine shot

4.2.3 Ensuring access to essential health services

Because Korea has not relied on a draconian lockdown while managing the transmission of infection, provision of essential services for patients with illnesses other than COVID-19 has been sustained without the health system being overloaded with COVID-19 patients. To ensure essential services for non-COVID-19 patients, the government designated "national relief hospitals" at the end of February 2020. One of the requirements for being designated a national relief hospital is that the hospital should have two separate outpatient treatment areas so those having respiratory symptoms may not come in contact with non-respiratory patients (MOHW 2020b). For such hospitals, additional fees for infection prevention and management were set to compensate for the extra effort to maintain the separation. As of June 7, 2021, 270 national relief hospitals were in operation to ensure access to essential services for non-COVID-19 patients.

Starting end-February 2020, telemedicine and prescribing without a visit to a doctor were temporarily allowed (with certain restrictions) to improve access to care and reduce the risk of infection during outpatient visits (APO 2020). Telemedicine was first used in Daegu Metropolitan City, where the rapid surge for medical demand and the resultant hospital bed shortage led to generation of a telephone-based severity scoring system (S. W. Kim et al. 2020). The recipients of telemedicine were patients who were unable to visit hospitals, isolated and quarantined patients, and patients with deteriorated mental health. Information and communication technology (ICT)-based remote patient management systems were also developed, using a patient-friendly mobile app, as well as wearable devices, for effectively monitoring asymptomatic or mildly symptomatic patients who were isolated in CTCs (Bae et al. 2020). Additionally, the rapidly changing circumstances of the pandemic led to changes in doctors' attitudes to telemedicine. Before COVID-19, telemedicine had not been allowed because of opposition mainly from local clinic doctors, who had concerns about losing their patients to large hospitals having better equipment. However, facing a sharp decrease in patients in local clinics in some specialties such as internal medicine and pediatrics, the KMA agreed to allow telemedicine temporarily for its members' interests as well as for patients' benefit. Since then, the NHIS has temporarily allowed the coverage for telemedicine service.

After over-the-phone medical consultation is done, prescriptions are sent to the pharmacy designated by the patient, and the pharmacist counsels the patient via phone or in a written format (APO 2020). According to the HIRA, which analyzed claims for 561,906 phone consultations and prescriptions from February 24 to June 2020, patients with hypertension, diabetes, and acute respiratory diseases accounted for the most significant proportion of users. In the case of acute respiratory diseases, there was no significant difference between face-to-face visits and telemedicine in the number of prescription drugs, although the antibiotic prescription rate was about 1 percent lower for those using telemedicine (HIRA 2020).

Usage of phone consultation service has been steadily increasing, with cumulative numbers reaching about 2.4 million as of July 4, 2021 (M. Kim 2021). Contrary to the local clinic doctors' concerns, the share of phone consultations by the local clinic doctors amounted to about 72 percent of the total phone consultations, which was in sharp contrast to the 42 percent share in May 2020. This observation is attributable to not only patients' safety concerns but also incentives for both patients and doctors. For the doctors, this was an additional 3 percent of the usual consultation fee, and for patients, the copayment for the additional fee was covered by the NHIS. After the COVID-19 pandemic ends, a decision on whether to maintain telemedicine in the benefits coverage of the NHI, or end telemedicine as agreed. may be highly controversial.

The prolonged COVID-19 pandemic and social distancing measures have had negative effects on the mental health of the population. To prevent mental illness during COVID-19, the CDCH jointly with the Korean Psychological Association (Special Committee on COVID-19) has provided psychological counseling services to citizens suffering from depression or anxiety. Since January 2020, the joint COVID-19 psychological support team has conducted psychological health evaluations through phone calls or face-to-face counseling to identify high-risk individuals and offer treatment to them (Republic of Korea 2020). The CDCH also decided to provide strengthened psychological support for high-risk individuals such as young adults, women, the COVID-19 workforce, and individuals diagnosed as confirmed cases, based on results of a survey on citizens' mental health related to COVID-19 (MOHW 2021b).

4.3 Public response

4.3.1 Social distancing, personal hygiene, and social norms

Until vaccines and medicines for new types of infectious diseases are developed, the importance of nonpharmaceutical interventions (NPIs) such as social distancing and personal hygiene, including handwashing and mask wearing, cannot be overemphasized.

Since the beginning of the pandemic, Korea has relied heavily on social distancing to prevent and manage COVID-19 cases. The government developed varying levels of social distancing norms, considering several factors such as public health concerns, feasibility, economy, public fatigue, and what has been learned from characteristics of the outbreaks (APO 2020).

Based on its experience with a campaign-style social distancing, at an early stage the Korean government first announced a three-level social distancing policy on June 28, 2020, which evolved into a more sophisticated five-level social distancing system on November 7, 2020. Later, to give more weight to the economy and citizens' fatigue, a four-level social distancing system was instituted starting July 1, 2021. Table 3 shows changes in the social distancing policy, including the extent of restrictions on principal areas such as public gatherings, schools, and business and workplace settings at each level.

The original policy was based on the number of daily confirmed cases in the region for two weeks. The government revised the policy in November 2020, by adjusting the thresholds to the number of daily confirmed cases for a week in the country.

The next revision in July 2021 strengthened the responsiveness to and accountabilities regarding local outbreaks and specified the types of facilities where protocols against infection transmission and sequential impact should be applied. Meanwhile, some adjustments and temporary flexibility were provided, depending on the seasonality of infectious diseases and conventional events, including national holidays.

Three colors were used to emphasize the distinct difference in social distancing as applied to major areas at each level. Green implies standard or voluntary quarantine; yellow means compulsory restriction; and red, total restriction. For instance, "public gathering" and "business and workplace" recommendations are to follow guidelines for hygiene maintenance and voluntary quarantine (green), to comply with the quarantine guidelines (yellow), or to strictly prohibit all gatherings (red). In terms of "school closure," green means schools are operating following the guideline to reduce the population density in a classroom, and yellow means school classes can only be remote (online) learning. No level "red" policy has so far been applied to schools, and classes have continued either in person or online during the pandemic. As vaccination rolled out, the government adopted several incentives for those fully vaccinated, such as a vaccine pass and an extended number of participants in public gatherings. But the mandates for vaccine passes were paused in 2022 following a suspension by the court.

Table 3: Summary of the Social Distancing Policy in Korea

Time	Level	Criteria	Major area		
			Public Gathering	School Closure	Business & Workplace
2020.06.28 - 2020.11.06	1	• Less than 50 cases	🟢	🟢	🟢
	2	• Between 50 tand 100 cases	🟡	🟡	🟡
	3	• Over 100 to 200 cases or the number of cases doubled twice a week	🔴	🔴	🔴
2020.11.07 - 2021.06.30	1	• In Seoul metropolitan area, less than 100 cases • In an urban area, less than 30 cases • In a rural area, less than 10 cases	🟢	🟢	🟢
	1.5	• Either meet the criteria of level 1 or the number of daily confirmed cases in the population over 60 for a week as follows: • In Seoul metropolitan area, less than 40 cases • In an urban area, less than 10 cases • In a rural area, less than 4 cases	🟢	🟢	🟢
	2	• If one of the following three conditions is met: • After level 1.5, the number of confirmed cases doubled for a week • Level 1.5 lasts in 2 regions for a week • More than 300 confirmed cases nationwide for longer than one week	🟡	🟢	🟡
	2.5	• More than 400 to 500 confirmed cases nationwide in one week, or the confirmed cases doubled after level 2	🟡	🟢	🟡
	3	• More than 800 to 1,000 confirmed cases nationwide in one week, or the confirmed cases doubled after level 2.5	🔴	🟡	🔴
2021.07.01 - 2021.10.31	1	• Average weekly number of confirmed cases less than 1 per 100,000 population: • Less than 500 cases nationwide and less than 250 cases in the Seoul metropolitan area	🟢	🟢	🟢
	2	• Average weekly number of confirmed cases more than 1 per 100,000 population • Over 500 cases nationwide and more than 250 cases in the Seoul metropolitan area	🟡	🟢	🟡
	3	• Average weekly number of confirmed cases more than 2 per 100,000 population • Over 1,000 cases nationwide and over 500 cases in the Seoul metropolitan area	🟡	🟢	🟡
	4	• Average weekly number of confirmed cases more than 4 per 100,000 population • Over 2,000 cases nationwide and more than 1,000 cases in the Seoul metropolitan area	🔴	🟡	🔴

Note: Based on government announcements.

Mask wearing is well known for its effectiveness in preventing droplet infection, although a mask-wearing culture varies depending on the society. Korean citizens have been accustomed to wearing masks and reducing social gatherings in case of an outbreak. A series of surveys was conducted between August 2020 and November 2021 to find out about the changes in daily life (Hankook Research 2021). The results showed that over 80 percent of participants were wearing masks in indoor settings, and 90 percent also reduced or cancelled social activities including eating out, socializing, and visiting public and multipurpose facilities. Despite such a high compliance, the public perception varied by subpopulation. Most citizens wore a mask in public transit and public spaces regardless of indoor or outdoor location. However, the younger generation under 30 also emphasized wearing a mask on the streets, while those above 60 years wore a mask at workplace and restaurants, indicating where each population spent time and energy during the day. More than 85 percent in all groups responded to wearing a mask with strangers, and more than 40 percent of the younger generation below the age of 40 tended to wear a mask even with friends and coworkers. More than 95 percent of the survey participants in June 2020 mentioned wearing a mask to avoid infection transmission from self, or to avoid getting infected, with COVID-19. On the other hand, 1 in 5 people decided to wear a mask only when the government recommended it, or when responding to peer pressure. The high compliance was supported by a sense of duty for citizenship and a feeling of security against transmission.

In a very early stage of the pandemic, the demand for masks outweighed supply. Therefore, the government had to implement the so-called "public mask system" under three principles (MOEF 2020): (i) one was allowed to purchase only two masks per week. Additional purchases could not be made even if one failed to purchase in the previous week; (ii) a five-day rotation system was in place for mask purchase. To reduce the waiting time and congestion while buying masks, the purchase was allowed only on the designated day according to the last digit of one's birth year; and (iii) a multiple purchase monitoring system was applied. Every individual residing in Korea was able to purchase masks by presenting his or her legal identification card at any purchasing site. An online system, developed by HIRA for drug usage review (DUR), enabled the seller to know, in real time, whether the purchaser bought more than two masks per week.

In the public mask system, proxy purchase of masks was allowed for those individuals who had difficulty visiting pharmacists. During the early phase, proxy purchase was only available for vulnerable populations such as the disabled, pregnant women, children born after 2010, and elderly people born before 1940. For them, eligible persons like a legal partner or housemate needed to bring the required documents, such as identification of the proxy purchaser or a copy of resident registration, to confirm that the purchaser and person lived together. However, anyone could purchase for the disabled or national wounded veterans if they brought the required document.

From mid-April 2020, the guideline was modified and allowed people to purchase masks on behalf of patients at nursing homes or regular hospitals, as well as elementary, middle, and high school students (MOEF 2020).

In July 2020, as the daily number of COVID-19 confirmed cases decreased and the supply of masks in the market increased, the operation of the public mask supply system was successfully ended, and the price of masks stabilized.

4.3.2 Trust in government and social institutions

Korean citizens have been complying with the government's interventions, including NPIs and restrictions on public gatherings, comparatively well. This is well reflected in the public's perception regarding the government's response to the pandemic. A polling organization conducted biweekly surveys on the public perception related to COVID-19 (Hankook Research 2021). The series of surveys showed a positive trend in the evaluation of government interventions. From February 2020 to November 2021, the proportion of answers stating "the Government is doing well" exceeded the opposite answer, except for answers in the second survey in February 2020 (figure 8). Furthermore, the public differentiated the government organizations constituting the control tower. The public trust has been highest for the KDCA—90 percent, at its highest, during May–June 2020—and the KDCA still earned 70 percent of public trust in November 2021. Although the overall trend for the MOHW and the Blue House, which refers to the president, was like that for the KDCA, there was less public trust in these two institutions (figure 9).

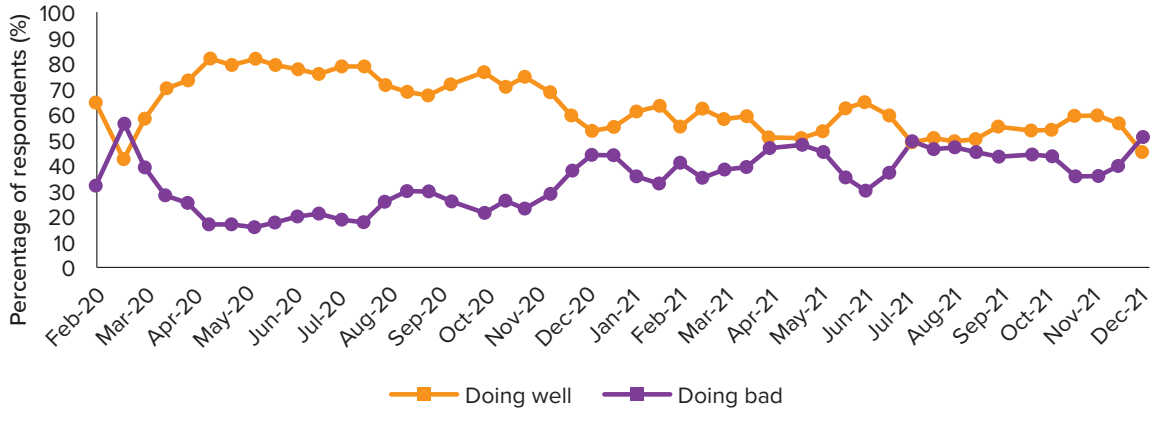
Information transparency has played a role in building public trust. According to a survey conducted in April 2020 using a stratified sampling of 1,000 Korean adults, the vast majority was attentive to the government's daily news briefing (79.3 percent). The briefing was considered useful by 77.4 percent, and trustworthy by 75. percent. However, a later survey conducted with the same questionnaire in August 2021 showed that efficacy of the government's daily news briefing decreased by more than 30 percentage points. This may mean that the citizens had begun to pay less attention to the tedious daily briefing, which had been monotonous for over one and a half years, and that it had become necessary to develop a new mode of more effective communication with the public.

Another survey showed that more than 80 percent of the respondents trusted experts' and the KDCA's response to the COVID-19, while less than a third and only 10 percent of them placed trust in the media's and politicians' response, respectively. Considering Korea's low score in media trust (Reuters Institute 2021), this result—the Korean citizens' wise placement of much more trust in experts than in the media during the pandemic—has contributed to the successful containment of the pandemic. However, it is also imperative to restore the public's trust in the media to efficiently manage and end the pandemic.

On the other hand, public perception of the issues related to information disclosure has not been consistent. In the repeated surveys conducted in 2020–2021, more than half of survey participants answered that aggressive contact tracing and/or a wide range of information disclosure should be given a higher priority than human rights. However, the percentage was reduced from 78.2 percent in February 2020 to 62.7 percent in February 2021. In a similar vein, most of the public supported tighter quarantine measures, even if they could have a negative impact on their economic status. This is because they believed that it would be impossible to have the economy revitalized without successful containment of the pandemic.

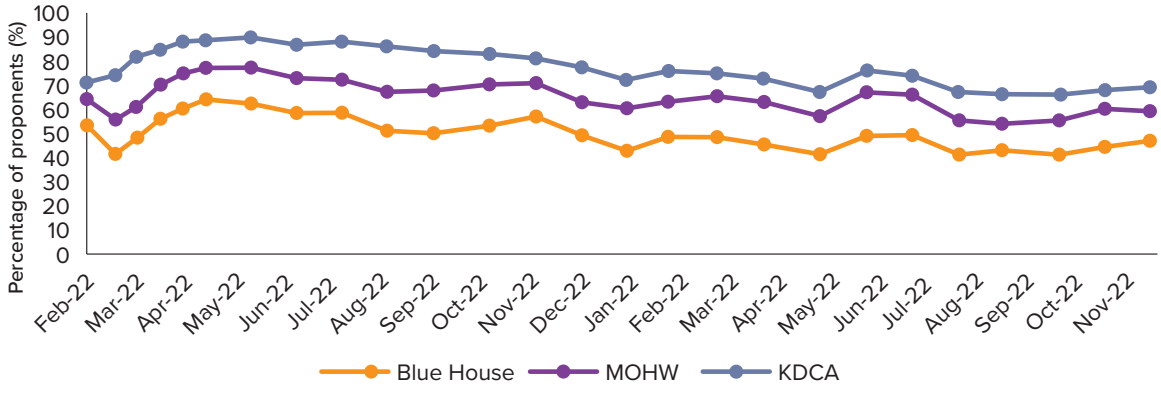
The Korean government launched multiple campaigns on social media to promote national solidarity and cooperation in the crisis response (Republic of Korea 2020). One example was the "Thanks-To-You Challenge" to support and express gratitude to medical personnel working tirelessly on the front lines of the outbreak, through use of the hand gesture that means "respect" and "pride" in sign language. The government also launched a campaign with the slogan "Cheer up, Daegu, Gyeongbuk-do" to highlight solidarity and support for those most afflicted with large-scale COVID-19 infections. Most Korean citizens responded favorably to these campaigns by hash-tagging the slogan or uploading a photograph of themselves doing the hand gesture on social media. But as time passed, medical professionals have argued for the substantial need for government support instead of campaigns. More than 70 percent of participants in a survey in November 2021 agreed that essential workers should be better treated and compensated (Lee 2021).

Figure 8: The public's perception of government response to COVID-19 (2020–2021)



Source: Hankook Research (2021)

Figure 9: Public trust depending on the government organization (2020–2021)



Source: Hankook Research (2021)

4.4 Vaccination

4.4.1 Procurement, access, and deployment distribution

In 2020, Korea suppressed the spread of infections and maintained low mortality rates enough to be a model country. However, the UK, US, Canada, Israel, and the European Union began vaccination in early December 2020, and Singapore in late December 2020, entering a new phase. It seemed that compared with those countries, Korea was lagging in responding to COVID-19, at least in vaccination, which started in late February 2021. This delayed start of vaccination may be attributable to numerous factors, one of which relates to a successful 3T (testing, tracing, treatment) strategy. Like the UK and US, countries that experienced an inundation of confirmed cases during the early phase may have relied desperately on vaccine rollout. In contrast, having contained the spread of COVID-19 relatively well, Korea was not active in securing vaccines and took a position of "wait and see" while some issues on vaccine safety were better known. This then seems to have led to an intermittent shortage of vaccine supply, perhaps due to late contracting with the vaccine manufacturers. This may be considered a kind of "paradox" associated with a success in 3T strategies, as demonstrated by a continued meager vaccination rate for about three months after the start of the vaccination in end-February 2021 (figure 10).

As of June 30, 2022, five types of vaccine have been available in Korea: vaccines from AstraZeneca, Pfizer, Moderna, Johnson & Johnson, and Novavax.[2] As ultradeep freezers were necessary, vaccine products from Pfizer and Moderna were available only in designated vaccination centers in the beginning, whereas those from AstraZeneca and Johnson & Johnson (Janssen) were available even in designated private clinics. However, according to the European Medicines Agency's recommendation of relaxed conditions for distribution and storage of mRNA vaccines, Pfizer and Moderna vaccines became available at about 1,500 designated private clinics across the country starting July 1, 2021. Depending on the availability and safety issues of each vaccine product and the public's preference, each product's share of the total number of inoculations has changed dramatically in Korea. As of June 23, 2021, the proportion of AstraZeneca (61.5 percent) was highest, followed by those for Pfizer (32.3 percent), Johnson & Johnson (6.2 percent), and Moderna (0.0 percent). However, as of March 2, 2022, the proportions were dominated by Pfizer (56.6 percent for the first dose and 62.9 percent for the second) followed by AstraZeneca (24.7 percent for the first and 21.6 percent for the second), Moderna (15.2 percent for the first and 15.5 percent for the second), Johnson & Johnson (3.4 percent), and Novavax (0.1 percent) (KDCA 2022c).

2 During 2021, there were four types of vaccines approved by the Ministry of Food and Drug Safety. The fifth type (Novavax vaccines that are produced by the domestic supplier) was authrized on January 12, 2022 (MFDS 2022) and the rollout followed on February 10, 2022.

4.4.2 Financing (donation, government budget)

Regardless of vaccine type, all vaccines are purchased using the government budget. However, operating costs (₩19,920, equivalent to about $18) are covered by either the government budget or NHI. The operating costs in the public health facilities are paid by the government, while the private clinics and hospitals are paid by NHI (70 percent) and the government (30 percent). This is a temporary measure considering that preventive service is not to be covered by NHI. The measure helps citizens get vaccinated free of charge.

In 2021, the amount and timing of the vaccine supply were unstable, so the government made every effort to extend the supply channels. This included promoting the development of the pharmaceutical industry, participating in the COVAX facility, and strengthening international diplomacy. Each effort contributed to the important decisions on vaccine donation and global partnership at the Korea-US summit. The US government announced the donation of vaccines after the summit with Korea in May 2021. One million doses of the Janssen vaccine arrived in June 2021 to strengthen the Republic of Korea (ROK)-US alliance and the KORUS Global Vaccine Partnership (MOHW 2021a). The KDCA announced the target population of vaccination according to the manufacturer's recommendations and the purpose of the donation (KDCA 2021b). Starting in June 2021, the following groups were able to choose whether to receive the donor vaccine: reservists, civil defense officers, those working in defense and diplomacy, residents in correctional facilities, and international seafarers. The Korean government continues its contribution at a global level and is designated as a global biomanufacturing workforce training hub by the WHO, for the purpose of addressing the vaccine inequity issue and enhancing pandemic preparedness (MOHW 2022a).

4.4.3 Coverage and equity

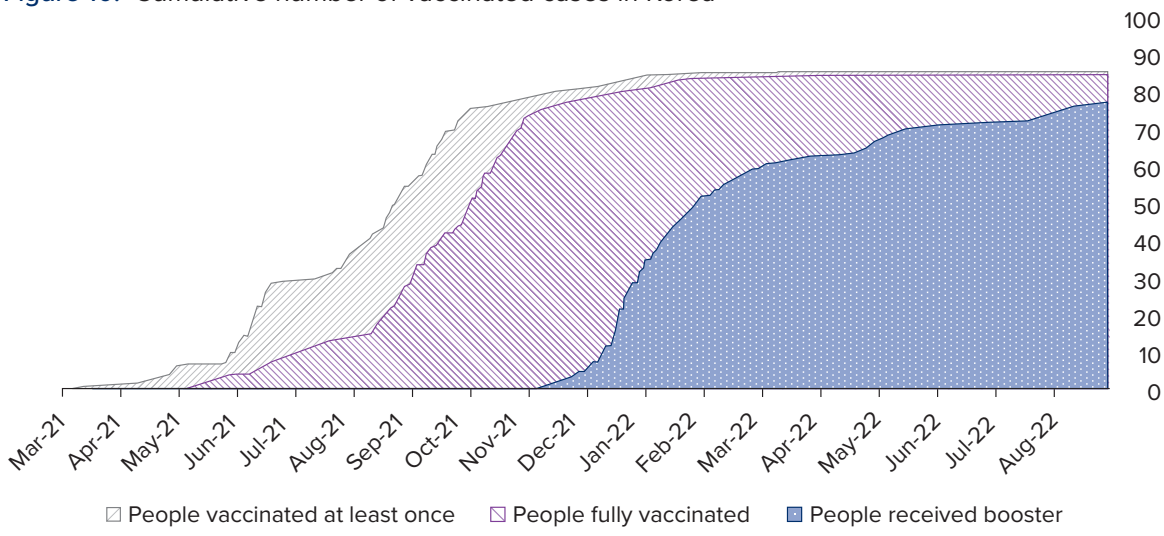
Vaccination started on February 26, 2021, targeting all residents of Korea to achieve herd immunity by November 2021, although some experts doubted herd immunity could be reached. As of July 24, 32.8 percent of the population had at least 1 dose and 13.3 percent was fully vaccinated. The inoculation rates did not increase for about three months after the start of vaccination, followed by increased uptake rates by end-May 2021. About four weeks later, however, the inoculation rates became sluggish again, due to poor supply of the scheduled vaccines. Since late July 2021, inoculation rates increased steadily. As of June 30, 2022, around 87 percent of the population had at least 1 dose and 86 percent was fully vaccinated (figure 10).

Early in 2021, the KDCA announced it would proceed with vaccination according to priority considering vaccine supply, inoculation rate, and the clinical results of each vaccine. Table 4 shows the priority for vaccination through a grouping of the target population according to objective. Based on the priority, the start date was set considering the risk of death, effect of preventing the spread of infection, and equity by age group.

The vaccination began with "residents and workers in long-term care facilities" and "health care workers in hospitals (mostly treating or dealing with COVID-19 confirmed cases)" in February 2021. It addressed the KDCA strategy that assumes that the priority is to reduce the mortality rate. The daily vaccination rate was low for the first two months in accordance with the KDCA's strategy and the procurement schedule. In April, the vaccination rate began gradually increasing with the expansion of the target population, starting from the general public over 75 years old and workers in long-term residential facilities or correctional custody facilities. The vaccination rate multiplied with the expansion of the target population, which was the elderly ages 65 to 74 years and 60 to 64 years, those having chronic diseases, and other workers in areas such as childcare, education, nursing, and so forth.

Meanwhile, the US government's donation of 1 million doses of the Janssen COVID-19 vaccine, which did not require booster shots, raised the rate of those fully vaccinated, especially among the male population over 30, who were pushed back on the priority list. Vaccination extended to those between 18 and 59 years old from August 2021. And starting October 18, vaccination was extended to pregnant women and adolescents ages 12 to 17 years, and booster shots were employed for the elderly over 60 years of age and high-risk populations.

Figure 10: Cumulative number of vaccinated cases in Korea



Sources: Mathieu et al. (2020)

Table 4: Priority for vaccination in Korea

Group	Goal	Target Population
A	To prevent severe infection and death of those having high risks	1. Residents and workers in long-term care facilities 2. The elderly using home care service, and its workers 3. Those 65 years of age or older 4. Adults with chronic diseases 5. Those between 50 and 64 years of age
B	To maintain essential social functions such as medical care, epidemiological investigation, and social services	1. Workers treating COVID-19 patients in medical institutions 2. Health care workers in high-risk medical institutions 3. First responders in local communities 4. Health care workers in medical institutions and pharmacies 5. Soldiers, police officers, firefighters, and social infrastructure workers
C	To prevent local infection (mass outbreak)	1. People living or working in mass facilities (other than the elderly) 2. Workers in educational and childcare facilities for children and adolescents 3. Those between 18 and 49 years of age
D	Exceptions based on clinical evidence	1. Children and adolescents 2. Pregnant women

Source: KDCA (2021c)

As of May 2022, the target population for vaccination was extended to children over five years old and the immunocompromised. It reflects that the KDCA has been pursuing evidence-based policy making. Several academic journals were published analyzing the status of breakthrough COVID-19 infection and the effect of vaccination on vulnerable populations, including children, high school students, and the elderly (MOHW 2022b). The data and implications were gathered from global experience. In this regard, the most recent study showed that the booster shots for the elderly ages 60 and over had a preventive effect—vaccination reduced infection, severe diseases, and death by 75 percent, 91 percent, and 92 percent, respectively (Kim et al. 2022).

4.4.4 Information, communication, and compliance related to vaccination

During the early phase of vaccination, the government faced some difficulties. On the one hand, the public and media complained about delayed procurement of vaccines, even though the health authorities had repeatedly clarified that there was no need for a rush and had elaborated on the vaccination plans. This was because they witnessed the impact of vaccination in other countries on lowering the severity and fatality of the infection. On the other hand, the public had concerns about side effects of vaccination, which were exaggerated by some media and politicians. This “infodemic” on efficacy and safety made citizens reluctant to get vaccinated, and, in fact, the intention to get vaccinated dropped by about 10 percentage points in May 2021.

To minimize the confusion and vaccine hesitancy, the KDCA offered an online reservation system that was adopted from the previous experience with the reservation system for public mask purchase. In addition, the government suggested some incentives for vaccination, which included “exemption from meeting restriction,” “discounted fee for entrance to public facilities,” “face-to-face visiting allowed for families in hospital,” and so forth. Partly due to these incentives, the inoculation rate increased sharply, as observed for a month starting at the end of May. However, this may have also given a wrong signal, as social distancing relaxed, and this was partly responsible for the fourth wave of the pandemic in Korea.

The COVID-19 vaccination, led by the government, has been made available to all Koreans and foreign nationals. All foreigners except short-term visitors staying less than 90 days are eligible for vaccination; enabling even illegal residents having an expired visitor or working permit to visit public health centers to make a reservation. To enhance the reach, the KDCA and the Ministry of Justice have collaborated to disseminate guidelines and information in different languages: English, Japanese, Chinese, Russian, Vietnamese, Cambodian, Uzbek, Filipino, Thai, Mongolian, Lao, and Nepali. Major contents are on the overview of vaccination policy, reservation for the vaccine, and procedures in case of an adverse reaction.

To ensure safety against any unavoidable or unexpected adverse reactions after vaccination, the National Compensation System for COVID-19 Vaccine Adverse Event was introduced. It began with a text message about key information and a link to report adverse reactions. The Personal Information Protection Act, and Infectious Disease Control and Prevention Act, were amended several times between 2020 and 2022. This helped the government to collect minimal contact information to help lay people increase health literacy and access emergency care. Also, the amended IDCPA enabled expedited compensation by allowing provincial and municipal governors to decide the compensation rules and amounts, to a limited extent (KDCA 2022a).

4.5 Protecting vulnerable people

4.5.1 The elderly

Since its start, COVID-19 brought to the fore the increased vulnerability of the elderly and their high case fatality when infected. Case fatality rates were 1.1 percent and 5.7 percent for those in their 60s and 70s, respectively, and increased to 18.8 percent for those in their 80s. Additionally, mass infections occurred in institutions, particularly in nursing homes and long-term care (LTC) hospitals, where most residents/patients are older adults. Until May 21, 2021,

a total of 2,262 patients and care workers in 95 LTC hospitals were infected with COVID-19, and 62 LTC hospitals were put under cohort isolation (group quarantine).[3]

To protect the elderly population and their caregivers from the risk of getting infected, a wide range of public health measures and policy responses have been implemented in Korea, targeting the LTC sector, along with population-wide measures, as described below.

4.5.1.1 Responses for the entire LTC sector

In February 2020, a response guideline was developed and released by the NHIS, the insurer for the public long-term care insurance (LTCI) in Korea. The guideline covers both institution- and community-based long-term care facilities, providing response principles and detailed instructions for various scenarios—for example, employees and/or residents who have been in contact with confirmed cases, employees and/or residents who are confirmed cases, and so on.

When the supply of masks was limited at the beginning of the pandemic, LTC service providers were able to order them for their care workers using the government's online system. The cost paid by the LTC institutions was about $94 to $114 for 100 masks in a box, including delivery fees.

A series of temporary reimbursement guidelines for LTC facilities and home-based LTC agencies has also been released by the MOHW and NHIS. The guidelines aim to minimize the negative impact of possible unavoidable changes in the care process at LTC institutions due to COVID-19, such as social distancing measures and staff shortages. Temporary reimbursements for the costs of preventive screening tests for employees have been mandated since December 21, 2020.

Vaccination priority was given to those residing and/or working in LTC hospitals and nursing homes, and to those 75 years of age residing in the community. The MOHW has announced that as of June 1, 2021, onsite visitors are allowed at LTC facilities if at least one party (visitor or resident) has received a full vaccination. The visit must be held in a separate, independent room, with no food or drink allowed.

4.5.1.2 Responses for institutional LTC

Since the beginning of the COVID-19 pandemic, the government and NHIS have implemented strict containment and other measures for institutional LTC, including social welfare facilities, LTC facilities, and LTC hospitals, as described below.

A monitoring system to check LTC facilities' compliance with the guidelines was introduced in late January 2020. This included awareness of prevention (implementing personal hygiene measures for workers and residents, checking temperature regularly to prevent group transmission) and control measures, education and training for care workers and residents, availability of hand sanitizers and masks, stringent entry and exit management of workers and residents, restriction of visitor access, and exclusion of high-risk workers.

Preventive cohort quarantines were ordered for some facilities in the Gyeonggi (March 1, 2020) and Gyeongbuk (March 5, 2020) regions, where confirmed cases had rapidly increased. The Central Disaster and Safety Countermeasure Headquarters (CDSCHQ) also recommended that respective local governments take preventive quarantine measures at residential facilities for older people and those with disabilities, if needed.

Nationwide investigations in LTC hospitals have been conducted from time to time to confirm the exclusion of care workers with a recent travel history to China or other affected regions, the restriction of visitors, the isolation of patients with pneumonia due to unknown cause, and the exclusion of care workers with physical symptoms (fever, cough, and so forth).

In addition, the CDSCHQ issued guidelines for LTC hospitals and mental health hospitals in February 2021, which included a comprehensive list of measures for infection prevention and management.

4.5.1.3 Community-based care

The closure of social welfare facilities as a containment measure was first recommended by the MOHW in late February 2020. Later, the timing of issuing re-opening guidance varied between regions, in response to the severity of the pandemic in each respective area. Social welfare facilities for the elderly that were closed at the beginning included senior welfare centers, dementia care centers, senior day/night care centers, and employment centers for older people.

3 More recent data is not available.

A mother putting a face mask on her son

To minimize the impact of the closures, the MOHW requested that care staff members in such facilities work as usual, even during the closure, and prepare to make sure that those who wish to visit will be able to use the facilities without difficulty when they re-open. Also, the MOHW requested that facilities make the utmost effort to prevent the spread of infectious diseases in facilities by checking the temperature of, and monitoring, workers and visitors.

The MOHW issued guidelines for social care facilities again, in November 2020. Following a change in the levels of social distancing measures (from three levels to five levels), the guidelines recommended strengthening preventive measures for social welfare facilities and keeping the facilities open until the social distancing level increased up to level 2.5 or 3, aiming to minimize the absence of social care services. The guidelines also provided detailed steps for the operation of social welfare facilities under COVID-19.

4.5.2 Women and children

4.5.2.1 Limited access to labor and delivery service for pregnant women

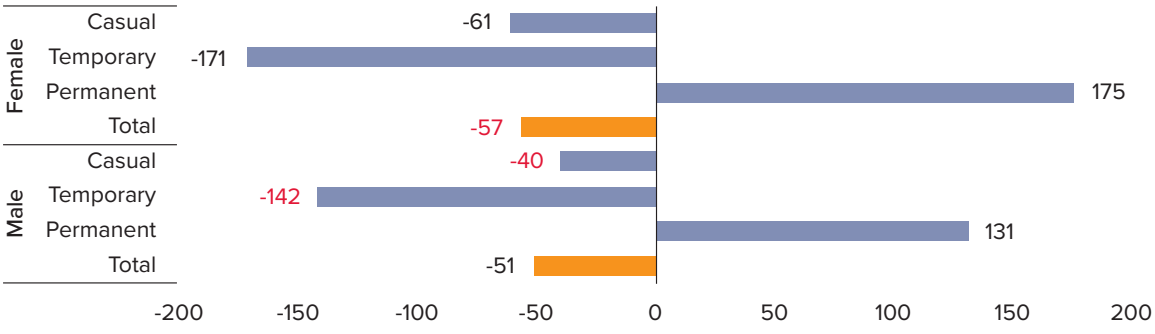
In the early days of the pandemic, there was controversy over the possibility of vertical transmission and the safety of delivery methods. The government designated a hospital for the suspected or confirmed pregnant women to have safe deliveries, while minimizing the risk of transmission, in Daegu City. The designated hospital was equipped with negative pressure isolation wards and facility for cesarean section (Oh et al. 2021). Measures to reduce the transmission risk during prenatal and postpartum management of newborns were also taken (Lee et al. 2020). However, strict procedures could have had a negative impact on accessibility to and quality of care. The gestational period and birth weight of infants born in the first eight months of the pandemic were significantly lower than those for infants born between 2011 and 2019. Additionally, the post-neonatal admission rate increased because of the relaxation of the criteria for admission to the neonatal intensive care unit (S. Y. Kim et al. 2021).

4.5.2.2 Unemployment gap for women

COVID-19 has exacerbated the gender gap in labor market participation, which had been slowly narrowing in Korea. Female workers were the first to take a leave or be dismissed following the restrictions in economic activity. They were more likely to be employed in the service industry or to have temporary contracts, leading to poor job security. Layoffs affected 20.9 percent of women workers, and only a third of them could find new jobs, with the rest remaining unemployed (W. J. Kim 2021). The most common reasons for discharging women were company closures, bankruptcy, and layoffs. The likelihood of dismissal was higher for those with lower literacy, older age, weaker job security, and limited work elasticity.

The gender gap in unemployment was also statistically significant. From 2009 to 2019, the labor market participation rate by gender gradually rose from 73.7 percent to 75.7 percent for men and from 52.3 percent to 57.8 percent for women. The labor market participation rate of the total population, which increased from 63.0 percent to 66.8 percent in 10 years, decreased to 65.9 percent in 2020. The pandemic had a stronger impact on unemployment for women, dropping 1.1 percentage points to 56.7 percent, while unemployment in men declined by 0.9 percentage points to 74.8 percent (KOSIS 2021a). Figure 11 shows the change in wage workers by employment type and gender in 2020 compared to 2019. The overall number of workers, as well as the number of casual and temporary workers, decreased regardless of gender. However, the decrease in the number of women was 29,000 more than for men among the temporary workers, and 21,000 more than for men among the casual workers.

Figure 11: Changes in wage workers by gender and employment type in 2020 compared to 2019

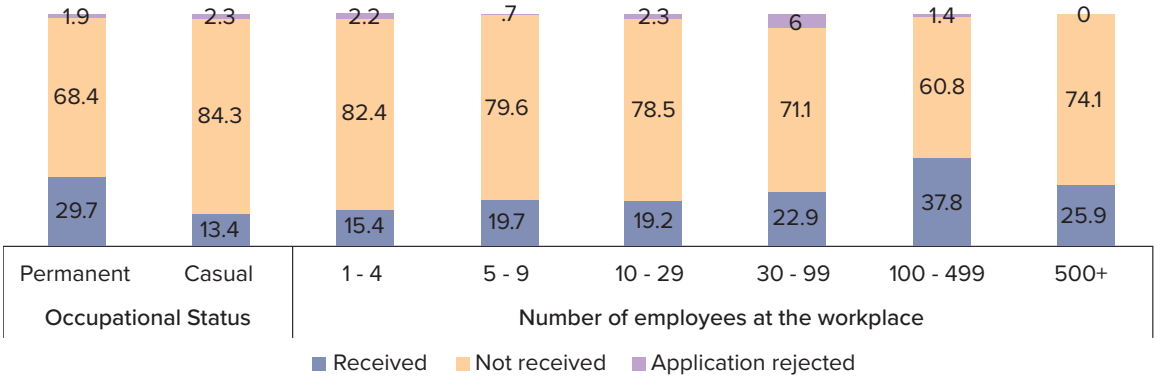


Unit: thousand person

Source: W. J. Kim (2021)

Among the women who lost their jobs during the pandemic, only 54.5 percent had employment insurance, and only a fifth of them (21.8 percent) received unemployment benefits (W. J. Kim 2021). The majority of those who did not receive unemployment benefits did not even have employment insurance or did not meet the qualifications. The female workers who did not receive unemployment benefits increased with age, unstable labor contracts, and smaller workplaces. Figure 12 shows the percentage of unemployment-benefits recipients. The recipient rate among temporary/daily workers (13.4 percent) and those working for a company with fewer than five employees (15.4 percent) was lower than the overall recipient rate (21.8 percent). Only 16.6 percent of companies received employment maintenance subsidies, after adjustment measures such as business closure and leave of absence. Among female workers on the job then, 42.9 percent were unaware of whether their employers had received employment maintenance subsidies or not. The reception and recognition rates of the employment subsidy varied depending on the type of job. The proportion of employment maintenance subsidies recipients was lowest, at 9.7 percent, among workers in lodging and restaurant businesses and highest, at 26.3 percent, among workers at enterprise service businesses (W. J. Kim 2021).

Figure 12: The percentage of unemployment benefit status by occupational status and company size in 2020



Source: W. J. Kim (2021)

4.5.2.3 A knock-on effect on childcare

From February to August 2020, opening childcare centers was a controversial issue due to the risk of infection among children, as there was a total of 131 confirmed cases at childcare centers: seventy were employees and 61 were enrolled children (Kim and Park 2020). Although this was attributed to childcare facilities being the route of infection, and childcare teachers as the source of infection, the infection pattern for childcare workers and children was different depending on the three periods: initial closure, reopening, and phase-2 social distancing. The number of confirmed cases among the employed at childcare centers remained evenly distributed at 23, 22, and 25, respectively. On the other hand, the number of confirmed cases among the enrolled children was 6, 16, and 39, respectively, for those three periods. This increases suggested that the level of community transmission had a significant impact on children.

Korea's childcare service had been rapidly expanding due to the low fertility rate—below one—and the social movement toward gender equality and work-family balance. However, the pandemic has exacerbated women's burden of care at home, as much as their career interruption. Promoting the prohibition of public gatherings and restrictions on publicly used facilities contributed to the heavy responsibility of female workers with young children, especially preschoolers. Starting with the expansion of telecommuting and the closure of childcare facilities, parents and children had to adapt to spending all day together under one roof. As work and family could not be separated, women had increased workload of housework and care labor. According to one study based on serial surveys (Y. K. Choi et al. 2020), the parental care burden was experienced in about a third of households raising children under the third grade of elementary school. Among families with preschool children, the rate of withdrawing from care facilities in March 2020 was 43.4 percent, and this percentage increased among vulnerable households, where workers were unable to work from home or had limited human and financial resources.

The government responded to the issue by opening "emergency childcare" locations for children in early elementary school, divided into morning and afternoon sessions. According to data submitted by the Ministry of Education to the National Assembly, the number of children receiving emergency childcare increased significantly in 2021 compared to 2020 (NARS 2021). In addition to the availability of safe facilities and staff recruitment, several factors may have affected the increase in emergency childcare recipients. Early on during the pandemic, care by family members was preferred over emergency childcare due to the risk of infection. However, the prolonged pandemic led to the exhaustion of annual leave of working parents, difficulties with remote education, and the lack of teaching materials and learning opportunities. Furthermore, the new phase of the pandemic, of breakthrough infection and variants, has interfered with complete reopening of schools.

Meanwhile, the burden of childcare is not shared equally between husband and wife. A study showed a significant difference: the average childcare time for working women increased after the start of COVID-19, and that for full-time housewives increased even more, while that for men remained as low as before the pandemic regardless of whether they were dual-income earners (Eun 2020).

4.5.2.4 Gender-based violence

Changes in the pattern of crime could indicate changes in the behavior of the population before and after the COVID-19 outbreak (KIC 2021). The Korea Institute of Criminology investigated the changes in 10 types of crimes, among which sexual violence, domestic violence, and dating violence, which are counted as gender-based violence, were included.

The periodicity of sexual violence, which occurs the least in winter and the most in summer, has remained the same before and during the pandemic. The monthly average number of cases in 2018 and 2019 was lowest in January, with 52 cases, and highest in July, with 107 cases; the numbers in 2020 for the same periods were 55 and 85 cases, respectively. Domestic violence, which has been declining in recent years, showed the same trend, contrary to reports from overseas indicating that domestic violence increased proportionally to the time spent at home. Dating violence remained at the same level as that of the last two years, with an average of 120 to 150 cases reported per month.

However, the gender segregation statistics and information collection and management systems are still facing challenges in Korea, and hence it cannot be concluded that gender-based violence either decreased or increased during the pandemic.

4.5.3 The poor and migrant workers

4.5.3.1 Testing and treatment for migrant workers

In the early stages of the pandemic, the Korean government tried to guarantee medical access for migrant workers as much as possible. It allowed migrant workers to receive COVID-19 tests and treatment for free regardless of their residential status. The KDCA, local governments, and nonprofit organizations disseminated health information by translating press releases and campaigns. The translated materials needed to be prepared in more than two languages for immigrants using neither Korean nor English. Besides testing and treatment, anyone could purchase the same number of public masks at the same price (below about $2 each). Accordingly, 86.8 percent of migrant workers who participated in a survey were aware of information about testing and treatment, and 93.7 percent were aware of how to purchase a public mask (K. T. Kim et al. 2020).

However, a significant number of migrant workers returned to their homes as they could not endure the risk of infection, social distancing policy, and income loss due to the prolonged COVID-19 period. According to Immigration Statistics for 2016–2020 from the Ministry of Justice (MOJ 2021), the number and proportion of those residing in Korea with a non-Korean nationality, out of the total resident population, increased from 2.0 million (3.96 percent) in 2016 to 2.5 million (4.87 percent) in 2019, and decreased to 2.0 million (3.93 percent) in 2020. COVID-19 had a greater impact on the short-term residents as compared to long-term residents. The number of long-term residents increased from 1.5 million in 2016 to 1.7 million in 2019 and decreased by 0.12 million (7.0 percent) to 1.6 million in 2020. The number of short-term residents, on the other hand, increased from 518,000 to 792,000, and decreased by 367,000 (46.3 percent) to 425,000 in 2020.

The Korean government introduced mandatory enrollment in the National Health Insurance for migrants in 2019, but the financial burden of using the service has increased for worse-off migrant workers. A study (K. T. Kim et al. 2020) showed that 93.8 percent of 1,427 migrant workers who participated

Pedestrians wearing face masks in Seoul

in a survey for those having a work permit were enrolled in the NHI. The enrollment rate of migrants was relatively low, at 91.5 percent, for those having a nonprofessional employment visa (E9) and who were often treated as cheap labor workers, with a lower payment. This further increased their vulnerabilities, as the eligibility to receive benefit packages is limited and not easily restored once premiums are in arrears for more than six months. Among migrants, 12.3 percent had arrears, and so did 24.2 percent of the group with E9 visas.

4.5.3.2 Testing and treatment for homeless or residents in dosshouse

The homeless are one of the vulnerable populations who have difficulty meeting basic needs including food, clothing, and shelter. Many public shelters and centers for social welfare were closed or had insufficient infection prevention measures during the COVID-19 crisis. There were few institutions that provided sleeping rooms or referred services during the cold season. The social safety net did not extend to the homeless, while the public medical institutions, which the homeless could visit, were treating only confirmed patients. Hence the homeless experienced an interruption to their existing health checkups and even primary care, and they were also refused the use of social services if they did not have a cell phone, or they had no space to isolate before entering the facility. As social services were cut off, more homeless were driven into the streets, and their risk of exposure to infection further increased. The free meal service was likely the only support that the homeless received, and even that was repeatedly interrupted, as the number of people in the indoor dining space had to be limited, or the service time was reduced to limit the spread of infection (Lim 2020).

4.6 Innovation through leapfrogging

4.6.1 Information and communication technologies (ICTs)

Administrative computerization is one of the policy objectives that have been promoted for decades in Korea. In the early 2000s, the health insurance funds were integrated with medical claim procedures for social insurance. In the field of infection prevention and control, the 2nd Master Plan for Infectious Disease Prevention and Management (2018–2022) included the integration of networks from different ministries and governmental agencies as one of its main objectives. This has led to the integrated ICT-based network, centered on the KDCA, being developed to establish a real-time information-sharing system among organizations and improve access to, and readability of, information for the general population, private sector, and other stakeholders outside the country, if necessary. *The COVID-19 pandemic has demonstrated how cost-effective public policy can be when integrated ICT services operate as a standard procedure.*

To respond to the pandemic effectively, the Korean government has actively used various ICTs, which include the prompt development of artificial intelligence (AI)-based testing kits, the use of GPS for tracing and monitoring confirmed cases, mobile apps for managing and monitoring people confirmed positive with the infection, and the quick provision of information by making data public while ensuring transparency (NIA 2020). Several specific examples of ICTs used to respond to the pandemic are described below.

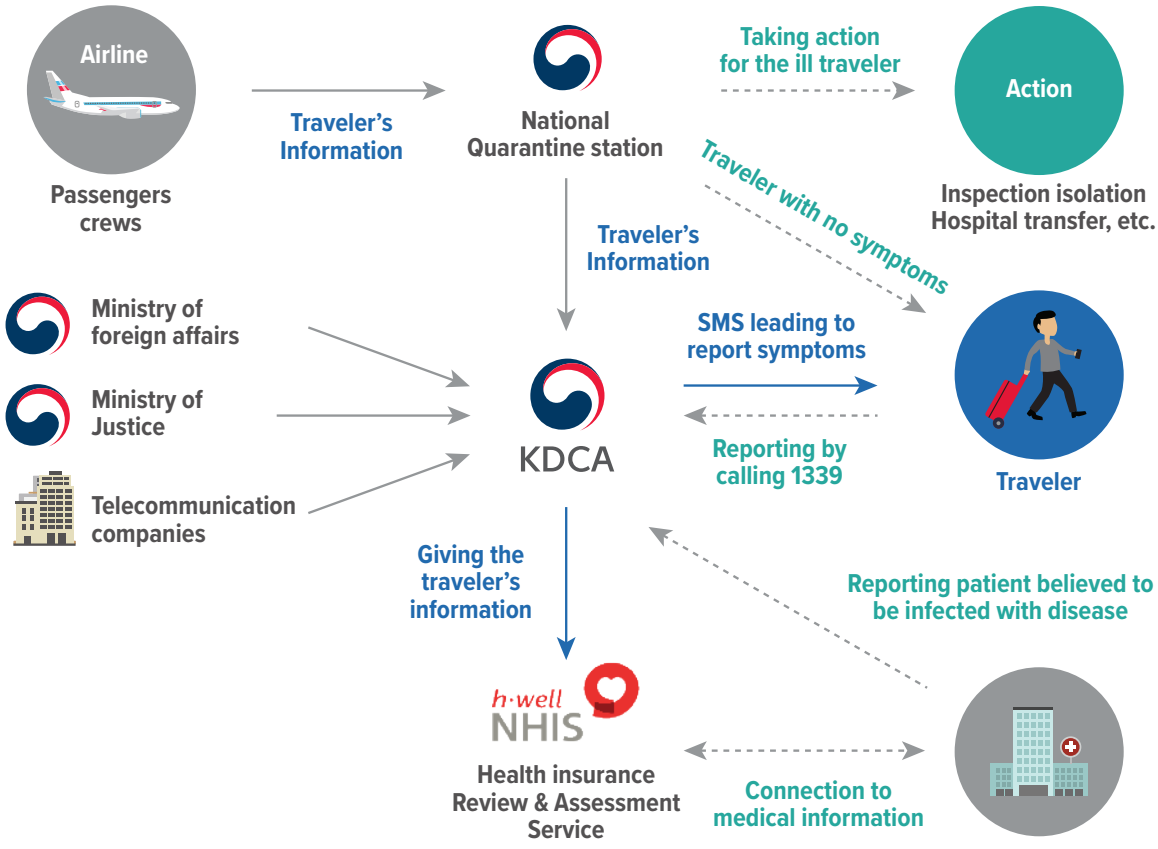
Smart Quarantine Information System (SQIS): The Smart Quarantine Information System is a national quarantine system based on ICT network connections among governmental agencies centered on the KDCA, with help from private telecom companies. The KDCA provides telecom companies with information on countries with confirmed cases of infection and, by using the subscribers' roaming data, tracks and monitors travelers entering Korea from high-risk regions during their incubation period. The SQIS links passport information, countries visited, information on inbound travelers, and data use of international roaming services provided by telecom companies (NIA 2020). Figure 13 shows the ICT framework of SQIS. The NHIS contributes to real-time verification of patients' eligibility for NHI benefits at clinical sites, improving access to care.

Self-Diagnosis Mobile Application: As the number of inbound travelers increased, the government introduced a mobile diagnosis app to efficiently monitor their health condition and to provide them with quick clinical advice. The self-diagnosis app can be easily downloaded at the airport on arrival, and travelers are required to install it when submitting their travel records. All inbound passengers must go through self-health check via diagnosis software once a day for 14 days of obligatory self-quarantine. In case a user develops any symptom, he/she is automatically connected to 1339 (call center of KDCA) or the nearest screening station (MOEF 2020).

Cellular Broadcasting Service (CBS): Through cooperation with mobile carriers, the government has been able to send message alerts to individual mobile phones in case of national disaster and emergency. Facing the COVID-19 outbreak, not only does the Ministry of the Interior and Safety directly send emergency warning text messages for timely delivery of public information; the local governments can also send warning messages to their residents. The CBS system can send messages without a delivery bottleneck in case of an emergency, as it does not use a general SMS text messaging channel (MOEF 2020).

Digital entry-exit list system: Since June 10, 2020, the Korean government introduced a digital entry-exit list system based on QR codes for infection-prone facilities. To begin with, the system was applied to eight types of high-risk facilities nationwide, including clubs, pubs, karaoke venues, indoor gyms, and indoor standing concert halls. Later its application was extended to large private educational institutions, buffet restaurants, churches, and other public gathering places. This digital entry-exit list system replaced the previous hand-written list system, which was likely to be plagued by a series of false entries. To minimize the possibility of privacy invasion, the minimum amount of personal information required for epidemiological investigations is collected and encrypted. In fact, two different types of information—personal information and visit records—are kept separate and combined only if necessary for epidemiological investigations (MOEF 2020).

Figure 13: The ICT framework of the smart quarantine system

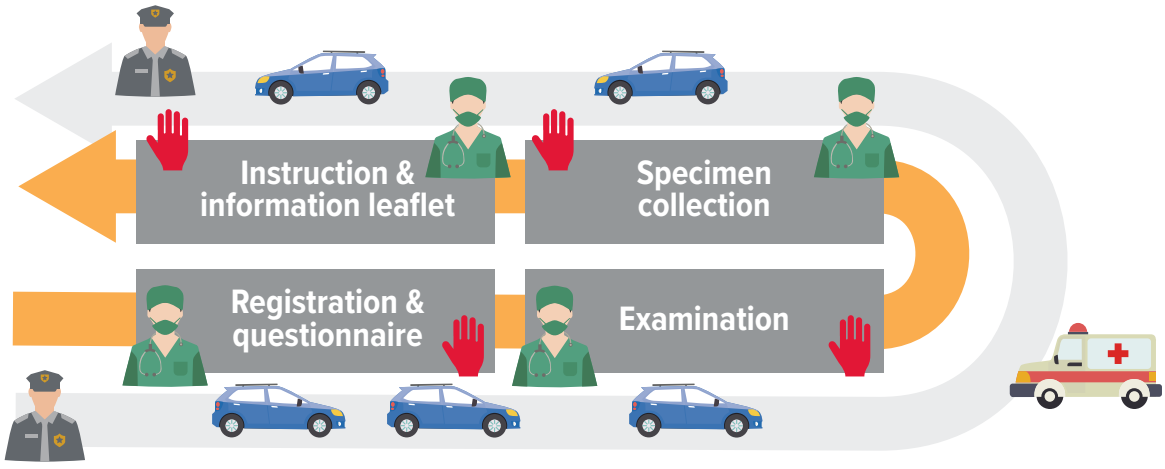


Source: NIA (2020)

4.6.2 "Drive-thru" screening system

Minimizing direct contact was the most important principle in implementing large-scale epidemiological surveillance and tracing investigations. Although the screening stations made a significant contribution, potential alternatives or substitutes were discussed to manage the use of physical and spatial resources and the risk of cross-infection, which could affect both visitors and medical providers during the testing procedure. The communication between medical providers and health authorities brought up the idea of "drive-thru" screening, which was originally designed to be used for drug distribution in the event of bioterrorism. The drive-thru screening system was introduced as one of the efficient models for infection control and mobility facilitation. It provided an alternative for testing, other than testing at screening stations and "walk-thru" testing. Each local authority and public health center could implement the available options depending on the specific requirement. For example, the drive-thru screening system could require additional personnel to guide the entrance and exit of vehicles in bad weather. However, compared to other options, it is about three times faster for one person to go through the entire testing procedure. The drive-thru facility operated by the Seoul Metropolitan government is reported to have tested up to 1,000 people in a day (NIA 2020).

Figure 14: The stages of the drive-thru screening system



Source: NIA (2020)

4.6.3 Public and private partnership (PPP)

There are several examples of public and private partnership (PPP)—collaboration between governmental agencies and private companies to cope with COVID-19, as described below.

Using real time-polymerase chain reaction (RT-PCR) for detecting COVID-19 infection, were developed through PPP. Seegene, a Korean company specializing in molecular diagnosis, had predicted the inevitable spread of COVID-19 in Korea and started developing the test kits on January 16, 2020, even when there was not a single confirmed case in Korea. The Korean government reciprocated the company's effort with emergency use authorization (EUA) for Seegene's test kits on February 12, 2020. By then, Korea had 28 confirmed cases with no deaths. Even though it usually takes about 12 months from a product's development for it to obtain approval, the Korean Ministry of Food and Drug Safety's (MFDS) decision to approve emergency use of the test kits was made within a week of COVID-19 detection in Korea. Taking only six hours to get test results, the AI-based test kits enabled accurate and fast detection with a single test (NIA 2020).

The global epidemic prevention platform (GEPP) was designed to identify transmission routes of infectious diseases and find those exposed to potential risks of infection by using mobile location data both at home and abroad. In the aftermath of the MERS outbreak in 2015, when the first patient entered Korea unscreened, the GEPP was built as part of the development of measures to respond to the import of novel infectious diseases to Korea. In 2016, two governmental agencies, the KCDC and the Ministry of Science and ICT (MSIT), collaborated with a local telecom company, KT, and developed digital tracing technology based on mobile data usage of mobile phone subscribers. This technology has been actively used in identifying the travel routes, sites of infection, and contacts of confirmed and potential patients since the beginning of the pandemic in Korea (NIA 2020).

Several AI-based call center services were used to reduce the burden on public health centers. In cooperation with Seongnam city, where its headquarters is located, a leading Korean ICT company, Naver, developed Clova CareCall, which is an AI solution for telephone counseling and automatic response to health inquiries via the company's AI platform, called Clova. Clova CareCall makes automatic calls to individuals under active monitoring twice a day (at 9 am and 3 pm) to check their daily health condition and their health status, which is directly reported to the public officials of local governments. Thus, this AI platform has replaced the previous man-to-man calls, and reduced dramatically the workload of the public health centers. Similarly, Hancom AI Check 25 is an outbound call system that uses AI voice recognition technology to check on the health condition of those under self-quarantine or active monitoring. The Korean leading software provider Hancom Group provides the AI Check 25 platform to the local governments of Jeonju, Daegu, Seoul, and others for free, to help administrators and public health centers reduce their work overload in response to the continued spread of COVID-19 (NIA 2020).

4.7 Measures to contain COVID-19 from a human capital perspective

4.7.1 Education

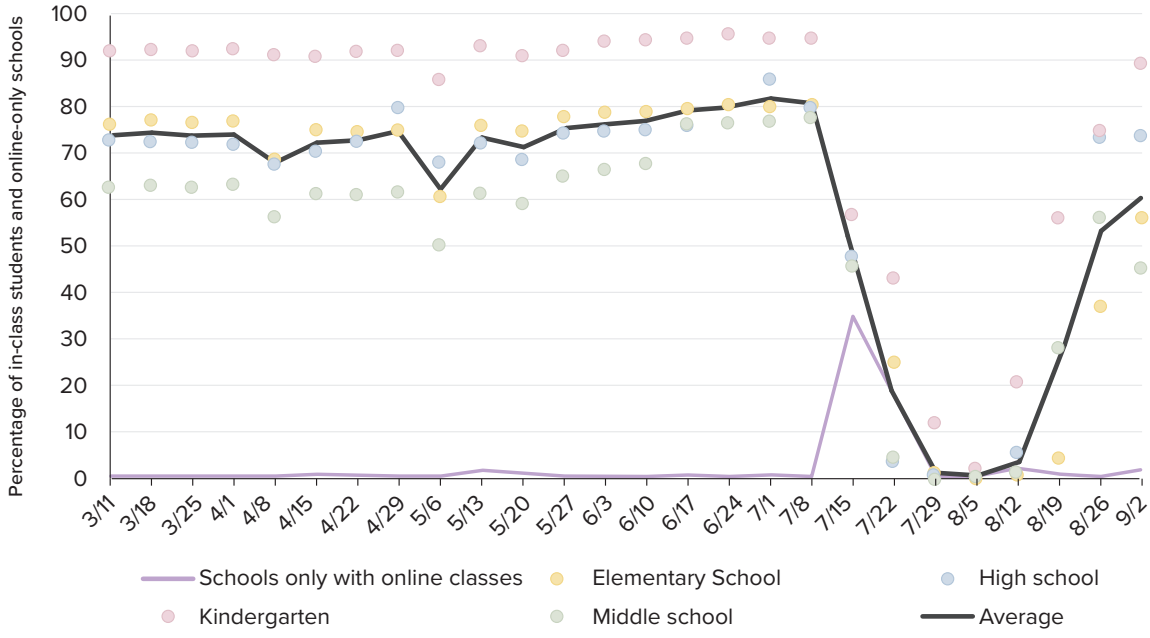
4.7.1.1 School closure

The Korean government took measures that prioritized the health and safety of students. As soon as social distancing was declared, the start of the spring semester of 2020 was postponed thrice within a period of a month. Online education, using electronic devices and the state-run Educational Broadcasting System (EBS), began as an alternative on April 9, 2020 (MOE 2020). To reduce the educational gap and inequality among students, the Ministry of Education (MOE) provided free digital device rental services and supported internet access for students belonging to low-income households, within the discretion of school principals (MOE 2020). While monitoring how smoothly and effectively online classes were running with continuous support for material and technical support, the education and health authorities decided to reopen schools in phases. This started with high school seniors preparing for college entrance exams on May 20. Since then, with the reopening of schools, a combination of on- and off-line classes has been provided during the several waves of COVID-19 infection.

Even in 2021, it was unclear whether the academic calendar year could proceed as planned, with surges having worsened each time in conjunction with the winter and summer vacations. Figure 15 shows the trend of students attending in-person classes at elementary, middle, and high school from March 2021, as well as that for schools providing education 100 percent online or during vacation time. From March to June, which corresponds to the first semester on the original academic calendar, the proportion of students attending in-person classes was maintained at an average of 70 percent. The attendance rate was over 80 to 90 percent in kindergarten or other schools for preschoolers or students with disabilities. From July to August, which corresponds to summer vacation, schools took a strategy of either providing full online education or shortening the vacation period to minimize the educational gap. Various quarantine policies and strategies were also adopted to secure schools as a space for socialization and experience. Reducing indoor student density through mixed education, monitoring isolated teachers and students after they tested positive, and testing before class entry were strategies that would not have been possible without the efforts of teachers, parents, and students. As a result, the number of confirmed cases per 100,000 among the students was low, at 17.9 to 61.5, even though the number of confirmed cases per 100,000 in the general population increased from 26.5 to 81.1 between March and July 2021. In addition, looking at the pathway of infection among students, the proportion of the confirmed cases was lowest, at 15.9 percent, in school, compared to 48.7 percent at home and 22.6 percent in the community (NARS 2021).

Preschool teacher and student wearing face masks in class

Figure 15: School Education Trend in 2021



Source: Ministry of Education (2021)

Note: This is the second data set processed by the authors, from the MOE press release issued once or twice a week.

The schools remained open since the reopening in November 2021. Facing the emergence of the Omicron variant, the Ministry of Education set four types of academic operation—offline including all activities, offline with limited activities, a hybrid of offline and online classes, and online classes—and asked schools to operate based on the new confirmation rate and absenteeism due to COVID-19. More than 88 percent of schools operated offline, and the school attendance rate across all school levels and types was about 82% in the first week of school after the advent of Omicron (MOE 2022).

4.7.1.2 Alternative measures for school education

It was a complex task to respond promptly with alternative measures for education. Schools were closed for a month, and this was the time given to coordinate the school schedule, create new teaching methods, and persuade stakeholders, from teachers at school to parents and students. The national emergency status put the whole nation on alert, which facilitated all necessary measures to be put in place faster than the revision of the legal basis. The Ministry of Education organized committees to prepare for school reopening and remote education. Once the guidelines on school closures and distance education were released, local governments and schools had the ability to take appropriate responsive measures.

However, there is criticism that the education policy was frequently reversed or changed depending on the stage of COVID-19 surge and social distancing policy. Unions and organizations led by teachers raised several issues: reduced quality of learning due to the increased burden of teaching for mixed classes, lack of concrete measures to solve indoor overcrowding, and the lack of learning support for students with disabilities attending schools not equipped for special-needs learning. Although the education authority responded by announcing the plan for complete school reopening in the second half of 2021, many details were left unclear.

Table 5: Types of online education

Types	Contents
Real-time bilateral class	Real-time remote education via platform using a video camera provides for real-time discussion, communication, and immediate feedback between teachers and students.
Content-driven online class	(Lecture type) Students learn from prerecorded lectures or contents for learning, while the teacher checks the learning progress and gives feedback. (Lecture + activity type) After watching content, students discuss with each other via written comments and replies.
Project-running online class	Teachers present tasks online and give feedback so that students can check their self-directed learning contents according to the achievement standards for each subject.
Others	The format can be set, if necessary, according to the conditions of each school district.

Source: Ministry of Education (2020)

4.7.1.3 Impact of school closure and online classes

Severe learning deficits among students were reported in November 2020 and contributed to the rapid expansion of in-person education and the planning of complete school reopening (MOE 2021). Student's academic achievements are measured in the third grade at middle schools and in the second year at high schools by testing three subjects—Korean, English, and mathematics. Compared to 2019, the proportion of those who did not meet the basic academic goal increased in all subjects, except for mathematics for middle school students. The proportion of those achieving above-average scores also decreased in Korean and English among middle school students, and in Korean among high school students. In 2020, happiness with school life, compared to that in 2019, decreased by 3.5 percentage points, to 59.5 percent for middle school students, and by 4.9 percentage points, to 61.2 percent, for high school students. Despite the positive perception and usefulness of remote education, it was unavoidable that the overall learning, motivation, confidence, and interest in studying was negatively impacted by the pandemic.

Good Neighbors, which started in Korea and extended its scope as an international nonprofit organization (INGO) promoting children's rights around the world, conducted an online survey (Good Neighbors 2020) targeting children from the age of four to adolescence in mid-June 2020, when the COVID-19 epidemic in Korea was on hiatus. The results of the survey, in which 3,375 children and their parents participated, were compared to those of the previous survey in 2018. The number of children eating three meals a day had decreased from 50.1 percent (2018) to 35.9 percent (2020), indicating that six out of 10 children were at risk of undernourishment. The number of children who did not eat because no one provided meals increased by about six times, from 1.3 percent (2018) to 7.6 percent (2020).

In Korea, it is not illegal for children to stay at home alone or just with their siblings; however, about 30 percent of the parents reported that the frequency of children staying at home alone or with only siblings increased after the COVID-19 crisis. The proportion of parents who responded that their children stayed at home alone or with their siblings for five days in a row on weekdays after COVID-19 increased as the children got older: 0.5 percent for preschoolers, 15.5 percent for the upper grades of elementary school (grades 4 to 6), and 29.1 percent for high school students.

As school education stopped for about three months and was partially substituted with alternative classes, beginning in May 2020, 47.6 percent of children experienced conflicts with their families due to prolonged use of smartphones. Increased amount of time on the internet was reported by 66.2 percent of all participants. Along with the increase in time watching TV or YouTube (from 18.0 percent in 2018 to 24.2 percent in 2020), the playtime of preschoolers and the time for interaction with the peer group of school-aged children decreased. The response rate of experiencing online violence, on the other hand, rose tenfold as the incidence rate

increased from 1.8 percent in 2018 to 20.7 percent in 2020. In the survey, online violence included verbal abuse, hate speech, and cyberbullying. In 2020, 10.8 percent of participants experienced sexual insults and harassment online, while 13.2 percent of participants had access to pornography via smartphones and computers.

Good Neighbors summarized the research results, indicating that, unlike other children overseas who experienced a significant decrease in freedom-related satisfaction, Korean children experienced a relatively significant decrease in health and economic status-related satisfaction during the pandemic. However, children worldwide have increased time for play and leisure, if watching TV and gaming are included as leisure. The research emphasized the importance of how children spend time during a crisis.

4.7.2 Social protection and jobs

4.7.2.1 Relief funds as social safety net

In 2020 alone, the government released supplementary budgets four times: ₩11.7 trillion in the first round, ₩12.2 trillion in the second, ₩35.1 trillion in the third, and ₩7.8 trillion in the fourth round. Disaster relief funds have been organized four times since May 2020—of these, the first and second disaster relief funds were included in the second and fourth supplementary budgets. The first relief fund was provided for the entire population, whereas the later three disaster relief funds were targeted to certain businesses, occupations, and vulnerable populations, especially small businesses and insecure workers whose sales were reduced, restricted, or banned during social distancing.

The first disaster relief fund aimed to provide a total of ₩14.2 trillion to 21 million households nationwide in accordance with the number of members per household. ₩12.0 trillion (99.5 percent) out of ₩12.1 trillion paid out was used within the expiration date of August 31, and ₩280.3 billion, equivalent to 737 thousand cases, was recovered as donations. The total scale of the second disaster relief fund was ₩7.8 trillion, of which ₩3.3 trillion was organized as the "New Hope Fund" for the vulnerable population. About ₩2.8 trillion was executed by the end of November 2020, and about ₩500 billion, which was not used, was carried over to the third disaster subsidy (J. H. Kim 2020).

With the prolongation of the COVID-19 pandemic and arrival of the third wave, the third disaster relief fund was customized for damage restoration. Unlike the previous funds, the fund was selective and paid to "those who suffered enormous damage from COVID-19," such as small business owners and the self-employed. In January 2021, ₩9.3 trillion was paid to about 5.8 million people who were eligible for support, but there was a mixed evaluation response on the criteria for selection and effectiveness. In March 2021, the fourth disaster relief fund of ₩4.1 trillion was organized, which expanded and further elaborated on the details from the third fund.

In the second half of 2021, the government no longer allocated the disaster relief fund but segmented financial support depending on schemes and programs. In July 2021, the "3 types of damage support package" policy was announced to induce consumption by the public to support small business owners. ₩250,000 per person was paid to the bottom 80 percent of the general population, and an additional ₩100,000 per person was paid to 2.96 million low-income earners. Small business owners affected by social distancing were paid up to ₩20 million to compensate for a decrease in business income. The government also employed a new cash-back scheme that would refund 10 percent of the increased credit card spending to stimulate consumption for two months, starting in October 2021. Unlike the cash benefit, the cash-back scheme had scoring criteria to exclude consumption in large-scale franchises and online shopping, with an upper ceiling of refund, which may have been too narrow to encourage participation.

Table 6: Summary of disaster relief funds in Korea

	1st	2nd	3rd	4th
Time	May 2020	September 2020	January 2021	March 2021
Budget	₩14.3 trillion	₩7.8 trillion	₩9.3 trillion	₩4.1 trillion
Revenue source	2nd supplementary budget (2020) + local taxes	4th supplementary budget (2020)	reserve fund	1st supplementary budget (2021)
Approach	Universal Payment	Selective cash benefits and tax reductions	Selective customized package (includes support of debts and loan)	Extensive customized package (includes voucher and scholarship)
Target group	General Population	Small business owners and vulnerable population	Those who suffered enormous damage	Those experiencing severe income loss
Details	Fixed amount per person, given to the head of household	Cash benefits and tax reductions for: small business owners, households with preschool children, casual workers, freelancers, the unemployed, low-income households, corporate taxi drivers	Additional groups: home care workers, business owners restricted by social distancing policy	Additional groups: chartered bus driver, street vendor, college student, tenant farmer, childcare leave worker, agriculture-related worker

Note: Based on the government press release
Sources: J. H. Kim (2020), Republic of Korea (2021b)

Several laws were amended as the pandemic continued. The Act for the Protection of and Support for Micro Enterprises resulted from the amendment of the IDCPA, as the legal basis for compensating for property loss caused by the state-led infection control measures. The act and enforcement ordinances for micro-enterprises were revised in July and October 2021, respectively. The law defines compensation for the decrease in sales profit due to bans on public gatherings, business curfews, and other policies. The loss estimation method and compensation scale differed from quarter to quarter due to changes in quarantine policies and resources allocated. The latest loss compensation was for the fourth quarter of 2021, which started in March 2022. It is reported that ₩1.15 trillion was paid in compensation to 460,000 business owners within a week after the applications were received.

4.7.2.2 Job loss and employment subsidy

In April 2020, approximately 476,000 jobs had disappeared since the previous year. The Employment Retention Fund was set up to subsidize small businesses retaining their employees without firing them. It covers up to 90 percent of the cost of retaining the employees. A total of ₩2.3 trillion subsidized 72,000 business owners for about 770,000 employees in 2020. In addition, premiums of industrial accident insurance and employment insurance for small business owners were reduced by 30 percent in 6 months.

Water, sanitation, and hygiene (WASH) are important public health issues, and compared to other developing countries, Korea has fewer cases of mass infection or death from water-borne diseases....

In June 2020, the first emergency employment security subsidy was provided to low-income job seekers participating in the Employment Success Package Program, This subsidy was paid up to three times at ₩500,000 per month. Nevertheless, the severe income loss of the self-employed or unstable employers continued. The second subsidy, ₩500,000 per person, was provided to the 500,000 people, who received the first subsidy in September. In addition, 200,000 new beneficiaries were paid ₩1.5 million in a lump sum after an expedited screening.

As social distancing was significantly strengthened through the third wave in December 2020, the third subsidy was given out in January 2021. An additional ₩500,000 was provided without separate screening for 650,000 existing recipients, while ₩1 million was provided for casual workers or freelancers with reduced income who had not received the first or second subsidy. The eligible beneficiaries were those with an annual income of ₩50 million or less, decreasing by 25 percent or more compared to the previous reference period. In March 2021, the fourth employment subsidy was provided in a similar fashion. An additional ₩500,000 was provided to existing beneficiaries, and up to ₩1 million was provided to those who had not received previous subsidies after screening applications. In addition, ₩700,000 was provided to taxi drivers and chartered bus drivers, and ₩500,000 was provided to care workers.

4.7.3 Water, sanitation, and hygiene (WASH)

Since the 2010s, Korea's water supply and sewage penetration rate has been at an average of 95 percent, and the gap between urban and rural areas is also improving. Water, sanitation, and hygiene (WASH) are important public health issues, and compared to other developing countries, Korea has fewer cases of mass infection or death from water-borne diseases such as diarrhea, food poisoning, typhoid, dysentery, and others.

Epidemiological surveillance of infectious diseases in general is under the jurisdiction of the KDCA. Statistics on food poisoning, however, are disclosed by the Ministry of Food and Drug Safety (MFDS), which oversees the safety of dietary supplements, medicines, opioids, cosmetics, and medical devices and supplies. In 2020, the MFDS reported the record lowest number of food poisoning cases since 2002—178 reported cases—and the number of food poisoning patients was 2,747, equivalent to 53 per 1 million people (MFDS 2021). Compared to the average food poisoning in the past five years, the number of cases decreased by 52 percent and the number of patients decreased by 40 percent. In response, the MFDS attributed this decrease to improved personal hygiene since the COVID-19 pandemic began, and to the strengthening of management and supervision after the mass food poisoning accident in a kindergarten in June 2020. In addition, the fact that there were fewer heatwaves with a maximum temperature of 30°C or higher than in previous years may have caused the decrease in food poisoning patients.

Night view of Gangnam district in Seoul

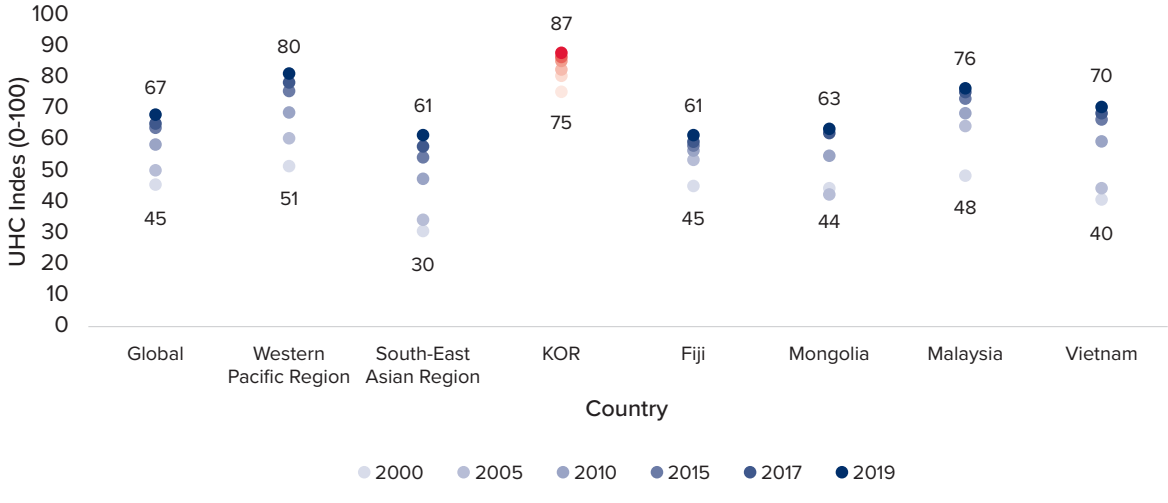
5. COVID-19 IMPACT ON THE PROGRESS OF UHC AND SUSTAINABILITY

5.1 Service coverage

5.1.1. Universal health coverage (UHC) index

The UHC index is a composite index that covers all four areas of reproductive, maternal, newborn, and child health; infectious disease control; noncommunicable diseases; and service capacity and access. Figure 16 shows the overall improvement of the UHC index in Korea and other countries in the East Asia and Pacific (EAP) region between 2000 and 2019. The global average rose by 22 points, from 45 to 67; in the Western Pacific Region it grew by 29 points, from 51 to 80, and in the South-East Asian Region by 31, from 30 to 61. Korea has recorded a modest increase of 12 points, from 75 to 87, which was steady at the highest value. In 2019, out of 18 tracer indicators in the four areas, Korea received the lowest score, 55, for "smoking" in noncommunicable diseases. There were three indicators that scored 100 out of 100: "at least basic sanitation" in infectious disease control, "hospital bed density," and "health worker density" in service capacity and access (WHO n.d.).

Figure 16: UHC Service Coverage Index



Sources: World Health Organization, Global Health Observatory Data Repository; World Bank, UHC Service coverage index

5.1.2. Impact of COVID-19 on medical use

5.1.2.1. Outpatient visits

The social distancing policy implemented to control COVID-19 and the redistribution of medical resources may have caused a decrease in medical access with increased unmet needs in essential services, and changes in medical use behavior. On the other hand, a decrease in medical use does not necessarily mean a decrease in the quality of medical services or in the level of population health. It is, therefore, essential to determine any significant changes in medical use due to the pandemic by type of institution or service. The number of annual visits to medical institutions per capita has gradually increased. In 2019, the average number of visits to all medical institutions was 21.19 cases per person, and the average number of outpatient visits was 18.28 cases (NHIS and HIRA 2021).

The HIRA compared the predicted number of visits and the actual number of visits from January to September 2020 using data on the monthly outpatient visits from January 2018 to September 2020 (P. H. Lee 2021). Compared to the prediction, outpatient visits per month decreased by about 10 million cases showing a reduction rate of 15.4 percent (95 percent CI (Confidence Interval): 11.8–18.9 percent). The difference between the predicted value and the actual value varied significantly by age group. The population under the age of 19 showed the most noticeable difference, with about 40 million cases (43.9 percent), compared to the population over the age of 80, which showed the least difference, with 4 million cases (5.0 percent).

Since personal hygiene practices such as wearing a mask and washing hands have increased, the number of outpatient visits for “diseases of the respiratory system (KCD-J)” decreased by about 40 million, from 110 million in 2019 to 70 million in 2020. Among the total population, the population under the age of 19 showed the largest decrease—it decreased by 20 million cases (59.9 percent). In terms of disease groups, the number of outpatient visits for “endocrine, nutritional and metabolic diseases (KCD-D),” “mental and behavioral disorders (KCD-E),” and “diseases of the circulatory system (KCD-I)” decreased by 3.5 percent, 5.1 percent, and 2.0 percent, respectively.

5.1.2.2 Inpatient care

Inpatient services utilization after the COVID-19 outbreak decreased quickly depending on the population-level medical needs and type of medical institution (Y. E. Kim 2021). Compared to the previous year, the number of hospitalizations decreased by 5.8 percent for men and 6.4 percent for women, from February to July 2020. The decrease also followed an age-group trend—hospitalizations decreased by 43.3 percent among infants and preschoolers, 30.6 percent among school-aged children, 5.9 percent among young adults, 3.0 percent among the middle-aged, and 2.0 percent among the elderly. Although hospitalizations at tertiary hospitals still increased slightly, other hospitals had fewer patients hospitalized—this number was reduced by about 10 percent compared to the previous year, due to COVID-19.

The actual use of inpatient services was less than the estimated use in 2020. Although the decrease in usage of outpatient services was much greater than that of inpatient services in general, patients having certain diseases, including hypertension, diabetes, chronic airway disease, and cancer, had increased medical use of outpatient service and decreased hospitalization.

5.1.2.3 Emergency care

After the cohort quarantine was first introduced due to mass infection in one local hospital in February 2020, the visit to emergency medical centers decreased by more than 20 percent compared to the previous year for six months between February and July (Y. E. Kim 2021). Preschoolers and school-aged children, respectively, had 57.8 percent and 45.5 percent fewer visits, as more parents began working at home, and childcare centers and schools were closed. The pandemic and health policies also changed the major causes for visiting emergency centers. Compared to the frequent diseases listed from previous years, the number of patients with respiratory diseases remarkably decreased, except for influenza, highly suspected to be COVID-19. At the same time, while patients with minor illnesses or injuries avoided visiting hospitals, patients under life-threatening conditions occupied more beds at emergency medical centers. Coincidentally, the proportion of deaths within a day or three-day window after arriving in the emergency room increased slightly, which may imply delayed arrivals due to COVID-19.

A traveler sitting on a safety bench in a bus terminal

5.2. Financial protection

5.2.1 Health expenditure by financing schemes

Over the past 20 years, Korea's overall health care expenditure has been steadily increasing due to several drivers, including advances in medical technology, economic growth, and increases in life expectancy. The Korean government kept aiming to achieve UHC by expanding the benefit coverage of the NHI. As a result of the merger of health insurance funds and the reforms after the financial crisis, the NHI established the single-payer system in Korea and rapidly increased its financial capacity (Kwon 2018). According to OECD statistics (2021a), health spending from the public schemes as a percentage of GDP rose from 2.1 percent in 2000 to 5.2 percent in 2020.

Meanwhile, the proportion of total health expenditure as a percentage of GDP rose from 3.9 percent in 2000 to 8.4 percent in 2020, implying that Korea's health expenditure per capita quadrupled from US$725 in 2000 to US$3,494 in 2020. Along with this increasing trend, out-of-pocket (OOP) expenditure also rose, from 1.7 percent to 2.4 percent as a percentage of GDP, as well as from $316 to $1,020 in per capita expenditure during the same period (OECD 2021a). In Korea, where the cost-sharing system is applied to the services included in the benefits package of the NHI, if the frequency and intensity of medical use increases, the total amount of OOP payments inevitably increases. Although the NHI has contributed to the price control of medical services in the benefits package, Korea's payment system, a fee-for-service system, provides medical providers with incentives to expand the volume of medical services or introduce new medical services not covered by the NHI. Therefore, the share of OOP expenditure remained at 30 percent to 40 percent of total health expenditures in the 2010s (KOSIS 2020). However, benefiting from the continued expansion of the benefits package of the NHI, the share of OOP expenditure in total health expenditures gradually decreased, from 43.6 percent in 2000 to 29.2 percent in 2020 (OECD 2021a).

5.2.2 Catastrophic health expenditure

Catastrophic health expenditure (CHE) is a useful concept for understanding health equity and comparing the level of financial protection in each country, and it is part of the Sustainable Development Goal indicators (SDG indicator 3.8.2). The definition and measure of CHE may have a significant impact on the estimate, because even the same medical bill amount may have different effects on households, depending on their ability to pay. According to a report published by the WHO and the World Bank, Korea experienced an increase in CHE using a 10 percent threshold of household expenditure, while service coverage improved. This increase was similar to that of other countries located in the West Pacific region (WHO and World Bank 2021). In many

Korean studies, although there is no agreed-upon definition of threshold levels, CHE is measured usually as health expenses exceeding 10 percent of a household's expenditure or income, or 40 percent of its nonfood expenditure. Regardless of the threshold and data set used, most studies showed a trend toward a significant increase in the incidence of CHE in Korea over the past period, even though the incidence varied depending on the studies (Kim 2019). For example, using data from the Household Income and Expenditure Survey, a study showed the incidence of CHE had increased since 2000: the incidence of households with health expenditures exceeding 10 percent of total expenditure and 40 percent of nonfood expenditure was 12.9 percent and 0.8 percent, respectively, in 2000, and these figures increased to 24.2 percent and 2.9 percent, respectively, in 2016 (Kim and Lee 2021). In addition, the concentration index for the catastrophic headcount had a negative value in almost all years, with its absolute value increasing, which means that distribution of CHE had been more concentrated among low-income households.

Due to the lack of data covering the years after the onset of COVID-19, it is not easy to predict the impact of COVID-19 on financial risk protection. Nevertheless, considering that the incidence of the CHE is affected by both OOP payment (numerator) and ability to pay (denominator), it is most likely that the incidence among the low-income households has increased even further as they are identified as economically vulnerable to the prolonged pandemic.

5.3. Financing for vaccination (fiscal space)

Purchasing vaccines is obviously burdensome to most governments around the world and requires arranging supplementary budgets. The Korean government also provided a supplementary budget for purchasing vaccines. Despite the delayed start with vaccination, the Korean government continued expanding the prepurchase contracts to secure as many vaccines as possible—these totaled 79 million doses as of March 25, 2021 (KDCA 2021a). Contracting with six different vaccine manufacturers/agencies allowed the Korean government to respond quickly to the changes in vaccine development and production. Table 7 shows the mix of vaccine products on the prepurchase contracts for 79 million doses, which would cost the Korean government ₩3.8 trillion. For the purchase of these vaccines, ₩2.3 trillion was included in the first supplementary budget in 2021. Factoring in the potential need for additional support for infrastructure and delivery of vaccinations, ₩1.1 trillion of ear-marked reserve budget was also set aside. Since then, the Korean government has made greater efforts to secure vaccines and the number of secured vaccines increased to 150.44 million doses as of March 2022 (KDCA 2022c).

Various aspects of financing for vaccination can be controversial, especially where the vaccine-related budget should come from, and whether any other health service needs to be forgone due to the budget constraint. In Korea, all expenses for purchasing vaccines came from the general government budget and supplementary budget. Although the revenue for vaccination rollout has been generated from general tax, the NHIS created temporary fees to reimburse service providers. One of the key features of the NHI, which covers most health services, is that it is financed through contributions, which are separate and independent from the government budget. Therefore, it is likely that the additional financial burden for purchasing vaccines has negligible impact on the progress of UHC in Korea.

The 2022 budget in response to COVID-19 can be categorized into two areas: vaccination rollout and overall infection control. ₩3.2 trillion was allocated to vaccination rollout—the largest proportion, ₩2.6 trillion, was designated for purchasing vaccines, and the remainder, for rolling-out activities and pre- and post-management. The budget for overall infection control was ₩1.6 trillion, about half of the vaccination budget—with diagnostic testing having the largest portion of all, at ₩626 billion, followed by procurement of treatment medicines, living support or sickness allowance, and incentives for service providers (KDCA 2021d).

Table 7: Korean government's fiscal strategy in 2020–2022

Year	Category	Amount	Details
2020 – 2021	Prepurchase agreements for vaccine	₩3.8 trillion	• 10 million doses from the COVAX facility • 10 million doses from AstraZeneca • 13 million doses from Pfizer • 6 million doses from Janssen • 20 million doses from Moderna • 20 million doses from Novavax
	Overall Infectious Disease Control and Prevention	₩3.5 trillion	• ₩356 billion from a supplementary budget in 2020 • ₩857 billion from earmarked reserve in 2021 • ₩2,348 billion from a supplementary budget in 2021
2022	COVID-19 vaccination rollout	₩3.2 trillion	• ₩2.6 trillion for vaccine purchase • ₩493.4 billion for vaccine rollout • ₩36.2 billion for adverse reaction monitoring and management • ₩128 billion for vaccine distribution management • ₩7.1 billion for additional expenses such as publicity and operating expenses
	Overall Infectious Disease Control and Prevention	₩1.59 trillion	• ₩393.3 billion for purchasing COVID-19 treatment medicines • ₩626 billion for diagnostic testing • ₩120 billion for incentives for infection control • ₩240.6 billion for living support or sickness allowance • ₩66 billion for central quarantine stockpile purchase • ₩8.3 billion for funeral expenses support • ₩23.7 billion for quarantine and hospitalization treatment expenses • ₩5.2 billion for COVID-19 variants investigation and analysis • ₩41.6 billion for support for the operation of temporary living facilities • ₩39.1 billion for support for screening clinics • ₩19 billion for management of call centers specialized in infectious disease • ₩700 million for self-diagnosis app operation • ₩5.8 billion for operation and support for national quarantine facilities • ₩3 billion for temporary support for screening clinic inspection personnel, etc.
	Supplementary budget against Omicron	₩2.29 trillion	• ₩618.8 billion for purchase of COVID-19 treatment medicines • ₩1,462.1 billion for living support or sickness allowance • ₩145.2 billion for local-level rapid antigen test diagnostic kits procurement • ₩6 billion for epidemiological investigators at screening clinics • ₩60 billion for incentives for infection control

Notes: The unit is Korean won (₩); ₩1,100 is equal to approximately US$1.
Sources: KDCA (2021a, 2021d, 2022a)

Night view of Gangnam district in Seoul

6. LESSONS FOR OTHER COUNTRIES: BEST PRACTICES AND CHALLENGES

The World Health Assembly was held in person in May 2022 for the first time in three years after the COVID-19 pandemic (WHO 2022). The theme was peace and health for recovery and renewal. It was a wake-up call because fragility, conflict, and violence have continued during the pandemic. Such incidents have had a critical impact on health inequity via various routes related to food insecurity, catastrophic health expenditures, and impoverishment. At the same time, hesitating or ignoring preparation for the next pandemic may challenge other health issues persisting from the pre-COVID-19 era.

But pursuing peace and health should lead to prioritizing a people-centered approach in collaboration with innovative social infrastructure and services. However, inflation and the trade bottleneck are sweeping the globe. Countries in the Asia-Pacific region are raising the level of trade restrictions rather than collaborating for post-pandemic preparedness. Korea is one of the countries that has been emphasizing health security and universal health coverage. There have been bilateral and multilateral development cooperation and multi-partnership agreements. Recently, Korea participated in the ASEAN (Association of Southeast Asian Nations) Health Ministers Meeting and Related Meetings to discuss Universal Health Coverage and Health Security for Resilient Health Systems (ASEAN 2022). While Korea is currently working to decrease the social distance guideline after lifting the quarantine policy, its experience can be a unique case in relation to infection control and health security. The lessons and challenges described below could support preparation for and response to the next pandemic.

Factors contributing to Korea's relative success in containing the outbreak, reducing its economic impact, and maintaining public trust during the COVID-19 pandemic include the following:

(i) A centralized control tower and coordination between central and local governments enabled rapid decision-making and empowered public-private partnership for timely response; (ii) a mix of concrete legal basis and institutional infrastructure strengthened the policy capacity and societal resilience (for example, the 3T strategy, public mask sales, and mandates of building negative pressure rooms); (iii) transparent risk communication and information disclosure attracted voluntary cooperation of the public; (iv) introduction of a patient classification system and community treatment centers (CTCs) helped tremendously to reduce the burden on hospital facilities by blocking the chain of infection; (v) ICTs improved transparency and efficiency by enabling real-time information sharing and open collaboration; and (vi) social health insurance in combination with general tax contributed to health financing functions by ensuring revenue generation, cross-subsidization, and financial protection.

...extensive testing and contact tracing combined with various levels of social distancing are highly effective in containing the spread of infectious diseases and reducing the number of new cases.

Some lessons can be drawn from Korea's experiences with successful responses to the COVID-19 pandemic.

a) Learning lessons from previous experience: it is important to learn from previous experience to be well prepared for the next crisis. The lessons learned from the experience with the MERS outbreak contributed to the enhancement of Korea's level of preparedness for the COVID-19 pandemic. At the time of the MERS outbreak, the Korean government was criticized for poor coordination between central and local governments and poor information disclosure. Since then, the Korean government has paid much attention to having both the legal framework and organizational structure ready for the next outbreak of infectious diseases, particularly in the areas of intergovernmental agency coordination and information disclosure.

b) Appropriate policy and legal responsiveness to amending/revising existing norms: even if regulations are in place to effectively respond to new infectious diseases, it is important to be open to the revisability of the legal framework depending on the actual situation. The Korean government aimed at transparent communication and information disclosure for effective contact tracing and tried to provide as much information as the law prescribed. However, facing criticism on privacy issues, the IDCPA was revised to reduce the scope of information disclosure while maintaining some essential information for contact tracing. This enhanced the transparency and openness of the government responses and, in turn, led to fostering the public's trust in them.

c) Effectiveness of testing, contact tracing, and social distancing: extensive testing and contact tracing combined with various levels of social distancing are highly effective in containing the spread of infectious diseases and reducing the number of new cases. This in turn helps to alleviate the burden on the health system until vaccines and medicines are developed. It is also helpful in maintaining the economy by minimizing interference with economic activities to the extent possible, compared to draconian lockdowns. However, it needs to be borne in mind that this kind of approach may be context-specific and may not be possible in all countries.

d) Reducing the burden on the health system, while minimizing case fatality: facing the outbreak of new infectious diseases, it is important to provide appropriate care for patients depending on their case severity, with the dual aims of minimizing case fatality and reducing the burden on the health system. At a relatively early stage of the pandemic, Korea was able to establish a patient classification system whereby asymptomatic and mildly symptomatic patients were sent to CTCs, while those with moderate and severe cases were hospitalized for treatment. The patient classification system, along with designation of CTCs, helped tremendously to reduce the burden on hospital facilities, which contributed not only to saving lives but also to efficient use of health care resources.

e) Integrated epidemiological network and applications using the ICTs: The integrated epidemiological network, empowered by a long-term policy, facilitated data sharing and improved efficiency across ministries and governmental agencies. Having KDCA as the center, the network smoothed intergovernmental operations as well as communications with the private sector and stakeholders abroad during the pandemic. The

Korean government actively utilized the ICTs in various parts of pandemic responses, especially for contact tracing and risk communications. In the process, the multilateral partnerships with the private sector allowed sharing of smartphone data and expedited the development of mobile applications. These enabled more accurate contact tracing and faster risk communication in the early stage of the pandemic, which helped increase transparency and compliance.

Although Korea's response to COVID-19 has been successful, there are several challenges:

a) Human resources issues, burnout, and incentives: extensive testing and contact tracing combined with distinct levels of social distancing could not be successful without dedicated health professionals, as well as the cooperation of the citizens. However, there may be a question on whether the current response to the pandemic could be sustained if it were prolonged further. This is particularly true considering that some cities and provinces have suffered from a shortage of health care workers during the prolonged pandemic. To make the health system sustainable, it is necessary to recruit and retain an adequate number of health manpower to avoid their burnout, and to ensure that their efforts are rewarded appropriately. In addition, most small business owners and the self-employed have shown a strong resistance to the persistent business curfew under the prolonged pandemic. To make the crisis response system sustainable, reasonable compensation schemes should be devised for those suffering from economic loss due to social distancing policies.

b) Effective communication versus infodemic: it is necessary to devise effective communication methods, as the public's perception of the government's briefings and text messages can be worsened during the prolonged pandemic. Despite a positive response, the Korean public showed a tendency to pay less attention to the government briefings and to tire of repeated text messages. Besides, the "infodemic" on the efficacy and safety of vaccination resulted in the public's becoming reluctant to get vaccinated. Therefore, policy measures to cope with the infodemic need to be developed, as misinformation can reduce the public's trust in the government response to the pandemic.

c) Balance between the level of social distancing and disruption of economy, education, and well-being: it is necessary to determine an optimal level of social distancing not only to save as many lives as possible, but also to ensure the livelihood of the citizens. Stringency of social distancing could reduce the number of confirmed cases and save more lives, but it may have negative effects on the health and well-being of the population through reduced income, a widened educational gap, and deepened inequalities. Thus, it is important to implement and maintain social distancing at such a level that it may not disrupt economic activities and learning opportunities unduly. At the same time, it is important to protect the population vulnerable to new infectious diseases, such as the elderly and the disabled, while maintaining social distancing at a certain level.

Pedestrians wearing face masks in Seoul

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