

# Coronavirus cases have dropped sharply in South Korea. What's the secret to its success?

A scary brush with Middle East respiratory syndrome led the country to set up the world's most expansive testing program for COVID-19

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A medical officer prepares to take samples from a visitor at a drive-through testing center at Yeungnam University Medical Center. REUTERS/Kim Kyung-Hoon

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Europe is now the epicenter of the COVID-19 pandemic. Case counts and deaths are soaring in Italy, Spain, France, and Germany, and many countries have imposed lockdowns and closed borders.

Meanwhile, the United States, hampered by a fiasco with delayed and faulty test kits, is just guessing at its COVID-19 burden, though experts believe it is on the same trajectory as countries in Europe.

Amid these dire trends, South Korea has emerged as a sign of hope and a model to emulate. The country of 50 million appears to have greatly slowed its epidemic; it reported only 74 new cases today, down from 909 at its peak on 29 February. And it has done so without locking down entire cities or taking some of the other authoritarian measures that helped China bring its epidemic under control. "South Korea is a democratic republic, we feel a lockdown is not a reasonable choice," says Kim Woo-Joo, an infectious disease specialist at Korea University. South Korea's success may hold lessons for other countries—and also a warning: Even after driving case numbers down, the country is braced for a resurgence.

Behind its success so far has been the most expansive and well-organized testing program in the world, combined with extensive efforts to isolate infected people and trace and quarantine their contacts. South Korea has tested more than 270,000 people, which amounts to more than 5200 tests per million inhabitants—more than any other country except tiny Bahrain, according to the Worldometer website. The United States has so far carried out 74 tests per 1 million inhabitants, data from the U.S. Centers for Disease Control and Prevention show.

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South Korea's experience shows that "diagnostic capacity at scale is key to epidemic control," says Raina MacIntyre, an emerging infectious disease scholar at the University of New South Wales, Sydney. "Contact tracing is also very influential in epidemic control, as is case isolation," she says.

Yet whether the success will hold is unclear. New case numbers are declining largely because the herculean effort to investigate a massive cluster of more than 5000 cases—60% of the nation's total—linked to the Shincheonji Church of Jesus, a secretive, messianic megachurch, is winding down. But because of that effort, "We have not looked hard in other parts of Korea," says Oh Myoung-Don, an infectious disease specialist at Seoul National University.

New clusters are now appearing. Since last week, authorities have reported many new infections, including 129 linked to a Seoul call center. "This could be the initiation of community spread," through Seoul and its surrounding Gyeonggi province, Kim says. The region is home to 23 million people.

## **Lessons from MERS**

South Korea learned the importance of preparedness the hard way. In 2015, a South Korean businessman came down with Middle East respiratory syndrome (MERS) after returning from a visit to three Middle Eastern countries. He was treated at three South Korean health facilities before he was diagnosed with MERS and isolated. By then, he had set off a chain of transmission that infected 186 and killed 36, including many patients hospitalized for other ailments, visitors, and hospital staff. Tracing, testing, and quarantining nearly 17,000 people quashed the outbreak after 2 months. The specter of a runaway epidemic alarmed the nation and dented the economy.

"That experience showed that laboratory testing is essential to control an emerging infectious disease," Kim says. In addition, Oh says, "The MERS experience certainly helped us to improve hospital infection prevention and control." So far, there are no reports of infections of COVID-19 among South Korean health care workers, he says.

Legislation enacted since then gave the government authority to collect mobile phone, credit card, and other data from those who test positive to reconstruct their recent whereabouts. That information, stripped of personal identifiers, is shared on social media apps that allow others to determine whether they may have crossed paths with an infected person.

After the novel coronavirus emerged in China, Korea Centers for Disease Control and Prevention (KCDC) raced to develop its tests and cooperated with diagnostic manufacturers to develop commercial test kits. The first test was approved on 7 February, when the country had just a few cases, and distributed to regional health centers. Just 11 days later, a 61-year-old woman, known as "Case 31," tested positive. She had attended 9 and 16 February services at the Shincheonji megachurch in Daegu, about 240 kilometers southeast of Seoul, already feeling slightly ill. Upward of 500 attendees sit shoulder to shoulder on the floor of the church during 2-hour services, according to local news reports.

The country identified more than 2900 new cases just in the next 12 days, the vast majority Shincheonji members. On 29 February alone, KCDC reported more than 900 new cases, bringing the cumulative total to 3150 and making the outbreak the largest by far outside mainland China. The surge initially overwhelmed testing capabilities and KCDC's 130 disease detectives couldn't keep up, Kim says. Contact tracing efforts were concentrated on the Shincheonji cluster, in which 80% of those reporting respiratory symptoms proved positive, compared with only 10% in other clusters.

High-risk patients with underlying illnesses get priority for hospitalization, says Chun Byung-Chul, an epidemiologist at Korea University. Those with moderate symptoms are sent to repurposed corporate training facilities and spaces provided by public institutions, where they get basic medical support and observation. Those who recover and test negative twice are released. Close contacts and those with minimal symptoms whose family members are free of chronic diseases and who can measure their own temperatures are ordered to self-quarantine for 2 weeks. A local monitoring team calls twice daily to make sure the quarantined stay put and to ask about symptoms. Quarantine

violators face up to 3 million won (\$2500) fines. If a recent bill becomes law, the fine will go up to 10 million won or as much as a year in prison.

In spite of the efforts, the Daegu-Gyeongbuk region ran out of space for the seriously ill. Four people isolated at home, waiting for hospital beds, were rushed to emergency rooms when their conditions deteriorated, only to die there, according to local media.

Still, the numbers of new cases have dropped the past 2 weeks, aided by voluntary social distancing, both in the Daegu-Gyeongbuk region and nationwide. The government advised people to wear masks, wash their hands, avoid crowds and meetings, work remotely, and to join online religious services instead of going to churches. Those with fevers or respiratory illnesses are urged to stay home and watch their symptoms for 3 to 4 days. "People were shocked by the Shincheonji cluster," Chun says, which boosted compliance. Less than 1 month after Case 31 emerged, "The cluster is coming under control," Oh says.

Yet new clusters are emerging, and for 20% of confirmed cases, it's unclear how they became infected, suggesting there is still undetected community spread. "As long as this uncertainty remains, we cannot say that the outbreak has peaked," Chun says.

## More data needed

The government hopes to control new clusters in the same way it confronted the one in Shincheonji. The national testing capacity has reached a staggering 15,000 tests per day. There are 43 drive-through testing stations nationwide, a concept now copied in the United States, Canada, and the United Kingdom. In the first week of March, the Ministry of the Interior and Safety also rolled out a smartphone app that can track the quarantined and collect data on symptoms.

Chun says scientists are eager to see more epidemiological data. "We are literally stamping our feet," Chun says. KCDC releases the basic counts of patients, their age and gender, and how many are linked to clusters. "That is not enough," Chun says. He and others would like to study detailed individual patient data, which would enable epidemiologists to model the outbreak and determine the number of new infections triggered by each case, also known as the basic reproductive number or  $R_0$ ; the time from infection to the onset of symptoms; and whether early diagnosis improved patients' outcomes. (South Korea has had 75 deaths so far, an unusually low mortality rate, although the fact that Shincheonji church members are mostly young may have contributed.) Chun says a group of epidemiologists and scientists has proposed partnering with KCDC to gather and share such information, "and we are waiting for their response."

Kim says medical doctors are also planning to share details of the clinical features of COVID-19 cases in the country in forthcoming publications. "We hope our experience will help other countries control this COVID-19 outbreak."

*With reporting by Ahn Mi-Young in Seoul.*

**\*Correction, 1 September, 9:10 a.m:** *A previous version of this story used an incorrect name for the Ministry of the Interior and Safety. It also said a new bill would increase punishment for quarantine violators to a 10 million won fine and up to 1 year in prison. It is 10 million won or up to 1 year imprisonment, but not both.*