

Researcher investigates preparedness for new disease outbreaks in South Korea

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The availability of adequate health care facilities is one of the most important factors that public-health policymakers grapple with when preparing for infectious disease outbreaks such as COVID-19.

And one of the most critical resources for controlling infectious respiratory diseases is the negative-pressure isolation room (NPIR). In a new study published online July 8 and in the November print issue of the *International Journal of Health Policy and Management*, a researcher from The University of Texas at Dallas investigated the allocation process and spatial distribution of NPIRs in South Korea during past outbreaks.

Dr. Dohyeong Kim, associate professor of public policy and [political economy](#) and of geospatial information sciences in the School of Economic, Political and Policy Sciences, is one of the study's co-authors. The researchers used historical data to evaluate whether South Korea is prepared for future outbreaks.

NPIRs work by lowering the air pressure in a patient's room relative to hospital hallways or other rooms, a configuration that pulls air into the room and prevents airborne diseases from escaping to infect others. If the rooms are built with several isolation functions, the possibility of spreading respiratory infectious diseases becomes almost zero.

"We are experiencing a very serious pandemic with COVID-19, and the actual outcomes are directly related to the amount of resources that each country has, that each community has, and also that each hospital has," said Kim, director of the Geospatial Health Research Group at UT Dallas. "Particularly for a very highly transmittable disease, keeping viruses within a certain confined area is really important."

Evidence Points to Shortcomings

In the study, Kim and his co-authors proposed that evidence-based spatial allocation methods can highlight gaps in preparedness and indicate specific locations to which governments should allocate funds to install more NPIRs.

Kim said they focused on South Korea because it has experienced several infectious disease outbreaks. Using [historical data](#) from outbreaks of severe acute respiratory syndrome (SARS) in 2003, swine flu (H1N1) in 2009 and the Middle East respiratory syndrome (MERS) in 2015, the researchers conducted chronological geographic information system (GIS) mapping to illustrate the variation of NPIR allocation.

The researchers also employed a technique called two-step floating catchment area method to measure recent NPIR coverage for different outbreak scenarios. They used population data from the Korean Statistical Information Service and infectious disease patient and hospital data from the Korea Disease Control and Prevention Agency.

The method allowed the researchers to estimate the level of mismatch between NPIR capacity and confirmed cases or population distribution. The researchers also considered other factors, such as health care accessibility.

The study revealed that there was no science- or evidence-based allocation of health resources in South Korea because of politics-oriented decision-making and a lack of expertise.

This practice revealed a substantial disparity between the supply and demand of health facilities across the country. Big cities, including Seoul, received the most funding and resources, while rural areas lacked necessary facilities.

Kim said a national plan for building NPIRs was never completed due to budgetary constraints and a lack of political interest, even after the series of outbreaks in the region.

The study findings suggest that South Korea should add more NPIRs and

allocate them more wisely to respond to novel [infectious disease outbreaks](#) such as COVID-19.

"The maps in our study clearly show that depending on the type of infectious disease in the next epidemic, even in the best-case scenario, there will still be some hot spots in need of NPIRs," Kim said. "But in the worst-case scenario, almost every region in South Korea would be concerning."

The researchers warn that NPIR allocation driven by political or administrative convenience is likely to result in unequal resource distribution. Instead, they suggest using technology and data to implement an evidence-based approach.

Concerns for Texas

Because of a lack of public data, Kim said he is not aware of specifics regarding NPIR allocation in Dallas-Fort Worth or Texas.

"If there is concern related to reducing infectious-disease transmission, then the government might consider taking a role in providing help for public-health purposes," he said. "These past few weeks, we've seen news reports of intensive care units being full or almost full, and hospitals in some areas reaching capacity. If COVID-19 patients, either confirmed or suspected, are treated in a regular room that is not equipped with negative pressure, and they're spreading the [disease](#), it creates a bigger problem."

Adding NPIRs would likely be more cost-efficient than building additional intensive care rooms, which require more specialized equipment, Kim said. Purchasing mobile NPIR equipment is another possible solution to explore.

"We need to have a good idea whether each region in Texas is prepared to handle these patients in a fair way, with no disparity across communities," Kim said. "At this point with COVID-19, we see a tremendous problem. It's a good time to evaluate and restructure the funding and allocation processes of these resources. Then, if there is a need for providing some public resources to hinder a worst-case scenario, policymakers can do some research and use this evidence-based approach."

Provided by University of Texas at Dallas

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