

## When will the coronavirus pandemic and social distancing end?

Up to two-thirds of a population needs immunity, via infection or vaccines, to stop COVID-19



Across the United States, people are fighting the COVID-19 pandemic by withdrawing from public spaces and staying home, leaving normally busy places like 42nd Street in Midtown Manhattan deserted.

PATTI MCCONVILLE/ALAMY STOCK PHOTO

By **Jonathan Lambert**

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As the gears of the modern world grind to a near halt, one question is likely on the mind of many: When will the coronavirus pandemic — and social distancing — end?

No one knows for sure, but it's probably not any time soon. Here's what we do know about when it may be safe to come out of our homes and resume normal life.

**It will almost certainly take herd immunity to end the pandemic.**

Most experts say we're past the point of

containing the virus, like we did with SARS and MERS. That means that COVID-19 is here to stay, and the pandemic will end only with herd immunity.

Herd immunity describes what proportion of a population has to be immune to a disease for the population as a whole to be protected from outbreaks. The exact threshold depends on the infectiousness of the disease, represented by the basic reproduction number, called  $R_0$  (pronounced "R naught").

When a new virus emerges, no one is immune. A highly transmissible virus, like the coronavirus behind the current pandemic, can spread like wildfire, quickly burning through the dry kindling of a totally naive population. But once enough people are immune, the virus runs into walls of immunity, and the pandemic peters out instead of raging ahead. Scientists call that the herd immunity threshold.

### **Up to two-thirds of a population would need to be infected to reach that threshold.**

Current estimates put the coronavirus's  $R_0$  between two or three, meaning anyone with COVID-19 tends, on average, to infect two or three other people. While this number can change based on our behavior, researchers estimate that the herd immunity threshold for COVID-19 is about

one-third to two-thirds of any given population. Worldwide, that means anywhere from 2.5 billion to 5 billion people.

Scientists aren't yet sure how long people infected with COVID-19 remain immune, but so far it seems that they [aren't readily reinfected](#) (SN: 3/4/20).

### **Letting the virus burn through the population would be the fastest approach.**

People acquire immunity against a virus in two ways: Either they have been infected and recovered — gaining some level of antibody protection — or they get a vaccine against the virus.

Since a [vaccine is at least 12 to 18 months from being available](#) (SN: 2/21/20), the fastest way to herd immunity would be to let the virus burn through the world's population unimpeded. According to a March 16 report released by researchers at Imperial College London, in the United States, the [pandemic would peak in about three months](#) under that scenario.

### **But....**

The costs of such a strategy would be overwhelming. Upward of 2 million Americans would die from infection alone, according to the same report. Roughly 81 percent of the U.S. population would get infected, the team estimates.

The elderly and those with underlying health conditions would be hardest hit, but [younger people, too, can experience severe illness](#) (SN: 3/19/20). And the critical care capacity of U.S. hospitals would be exceeded as early as the second week of April, and eventually require 30 times as many critical care beds as currently exist, the team estimates. While there is much still unknown about the virus, most experts agree with this overall picture.

The costs of delaying action any further to slow the virus' spread could be catastrophic, the researchers conclude. That's why countries around the world are trying various strategies to quell the surge in cases, in effect [flattening the exponential curve of the pandemic](#) and lessening the strain on hospitals. Those measures primarily consist of aggressive social distancing, such as closing schools, cancelling large public events and encouraging people to work from home if possible (SN: 3/13/20).

### **Social distancing reduces deaths but delays herd immunity.**

The necessary flipside of successful social distancing is that achieving herd immunity gets delayed as cases decrease, says Michael Mina, an epidemiologist at Harvard University's T.H. Chan School of Public Health in Boston. Even if collectively we prevent a surge in the coming weeks, he says, the virus could reemerge as soon

restrictions are lifted.

“In the absence of robust herd immunity at the population level, we have some risk of a second wave of the epidemic,” Mina says.

### **Social distancing will need to last 1 to 3 months at minimum, potentially longer.**

Society could keep a lid on such a resurgence by maintaining broad social distancing. The Trump administration on March 16 called for significant social distancing for at least the following 15 days. But most experts expect such measures will need to be in place in the United States for one to three months, at minimum, to keep hospitals from being overwhelmed.

We could get a big break if the virus’ spread slows with warmer weather, though so far there’s no indication that will happen. “That would be a great stroke of luck,” says Maciej Boni, an epidemiologist at Penn State University, and may allow more people to return to work once the number of new cases begins to fall.

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Keeping schools closed and encouraging people to generally stay home could suppress the

pandemic after five months, according

to the Imperial College London report. But once such restrictions are lifted the virus would, in all probability, come roaring back. Until a vaccine becomes available, potentially in 12 to 18 months, the report argues that major, society-wide social distancing measures are necessary.

But such drastic changes to daily life may be difficult to sustain, Boni says. "It's like you're holding back a wave of infections with Saran Wrap."

### **More widespread diagnostic testing could ease the need for extensive social distancing.**

Whether such strict isolation could be maintained for months on end is unknown. "We've never faced anything like this before," says Caitlin Rivers, an epidemiologist at the Johns Hopkins Center for Health Security. The economic costs would be enormous, especially for the most vulnerable members of society.

"But I'm not ready to give up on the lessons from places like South Korea and Taiwan," Rivers says. "They've shown the virus can be [locally] contained through general social distancing coupled with extensive testing, case isolation and contact tracing." South Korea, for instance, reported its [highest number of new cases, 909](#) on February 29. Since then, the number has steadily decreased. On March 24, [only 76 new cases were](#)

[reported](#).

While the United States is ramping up testing, it currently [cannot test as widely as many other countries](#) (SN: 3/6/20), allowing the virus to spread undetected widely across the country. Until that capacity increases significantly, the only tool the United States has to slow the virus' spread is blunt, widespread social distancing.

As staying home hopefully dampens the epidemic, Boni, Rivers and Mina all say it's key to use the coming months to rapidly expand testing infrastructure, while also bolstering health care systems.

Testing allows public health officials to identify new cases and isolate them, while tracing and testing their contacts as quickly as possible. Testing and isolating potential contacts before they develop symptoms is crucial, since the pandemic seems to be [driven by people who don't know they're sick](#) (SN: 3/17/20).

It would be "as though we're back at the beginning of the outbreak and taking targeted approaches," Mina says. With some luck, such an approach could keep outbreaks from spreading until a vaccine creates herd immunity.

The feasibility of such a program depends on many unknown variables. Firstly, it would require vastly more

testing than is currently available. It also requires rigorous and rapid contact tracing after a positive case, which is no small task. Some countries have used cell phone tracking data to aid this process.

### **A big unknown: Are all these efforts sustainable?**

At this point, there are still too many unknowns to know how — and when — we will reach herd immunity. In the coming weeks, epidemiologists will be closely tracking the number of new U.S. cases as well as the total number of tests to get a sense of whether social distancing is working in a particular region.

“It’s been amazing to see the swing in society over the past week,” Mina says. “Nearly everyone has gotten on board.” But he worries about the sustainability of such strict measures as the weeks wear on. “Societal forces may end up overwhelming the science.”

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**Editor’s Note:** This article was updated on March 24, 2020, to correct researchers’ university affiliation. We meant Imperial College London, not University College London.

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#### **CITATIONS**

N.M. Ferguson et al. [Impact of non-pharmaceutical interventions \(NPIs\) to reduce COVID19 mortality and healthcare demand](#). Imperial College London. Published online March 16, 2020. doi: 10.25561/77482