

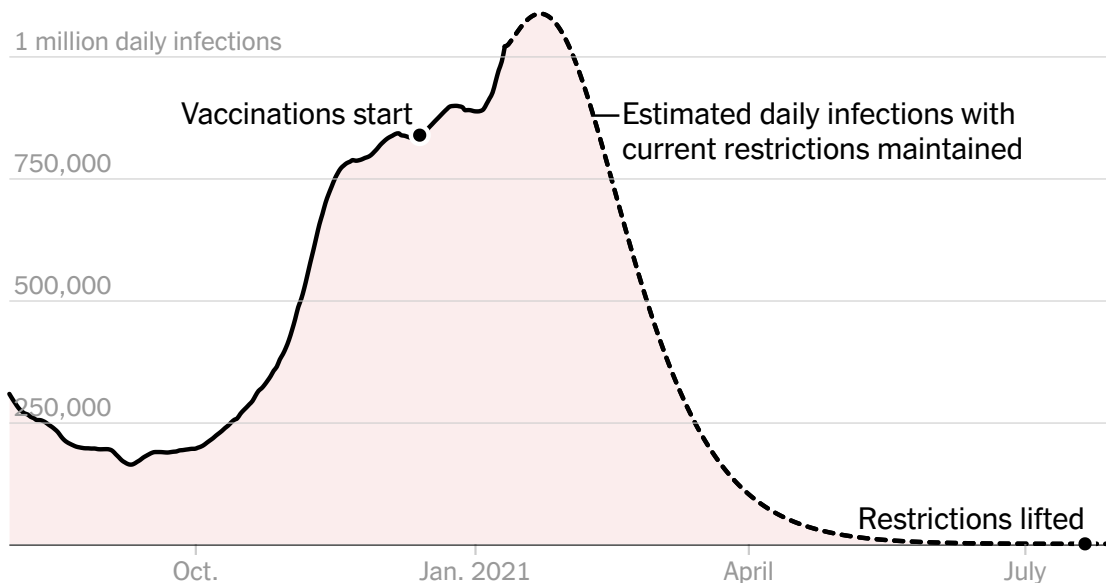
Why Vaccines Alone Will Not End the Pandemic

By Matthew Conlen, [Denise Lu](#) and [James Glanz](#) Jan. 24, 2021

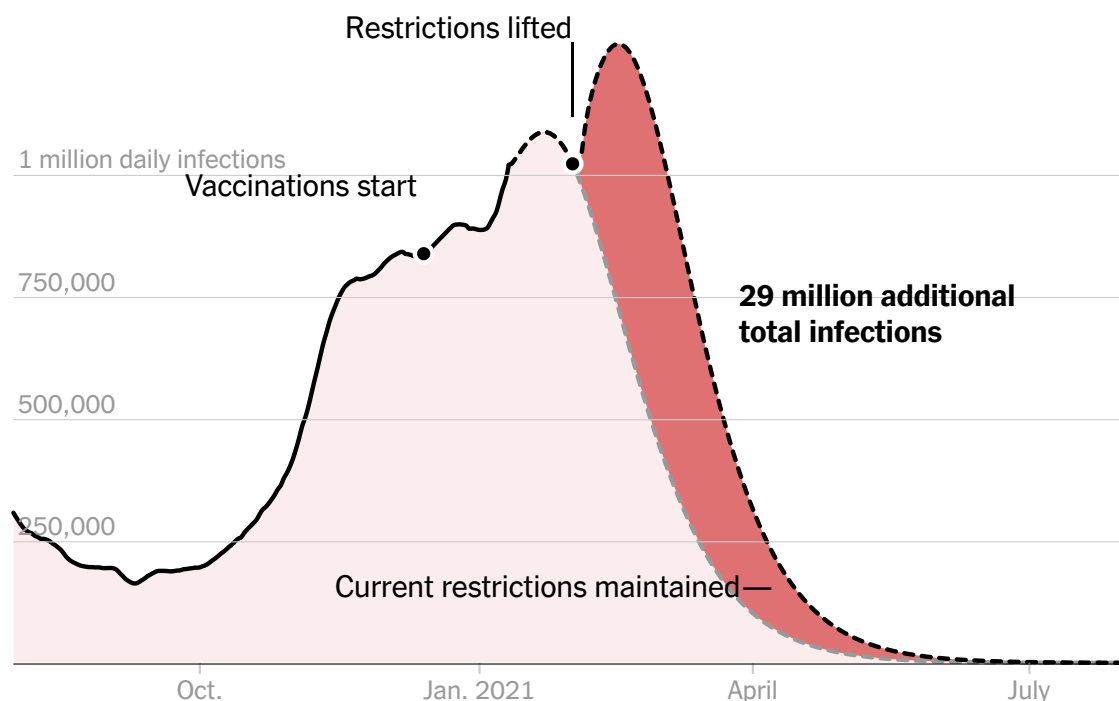
The coronavirus pandemic in the United States has raged almost uncontrollably for so long that millions of vaccinations will not be able to stop the spread of the disease unless people continue to wear masks and maintain social distancing measures until midsummer or later, according to a new model by scientists at Columbia University.

The arrival of highly effective vaccines in December lifted hopes that they would eventually slow or stop the spread of the disease through the rest of the population. But vaccines alone are not enough, the model shows. And if precautions like working remotely, limiting travel and wearing masks are relaxed too soon, it could mean millions more infections and thousands more deaths.

If current restrictions remain in place until late July



If restrictions are lifted in February



There is no doubt that getting vaccinated protects the recipient. Still, several infectious-disease researchers contacted by The New York Times cautioned that it would be months before enough people in the United States will have gotten the shots to allow for normal life to begin again.

Only then will the number of people with immunity — those who have had the disease and recovered, plus those who have been vaccinated — be large enough to take the wind out of the pandemic, said Jeffrey Shaman, an epidemiologist at Columbia who shared his team’s modeling calculations.

Dr. Shaman estimates that more than 105 million people have already been infected across the U.S., well above the number of cases that have been reported. And his projections show millions more infections are yet to come as the vaccine rolls out.

Estimated total infections in the U.S. if current restrictions are ...

... in place until late July

158 million est. total infections

... strengthened until late July



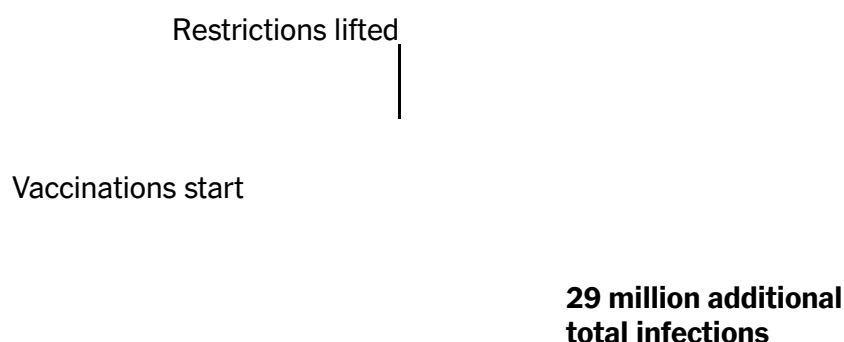
Social distancing, masking and other measures should remain in place until late July, “and that may be optimistic,” said Dr. Shaman. Otherwise, yet another resurgence of the virus is possible.

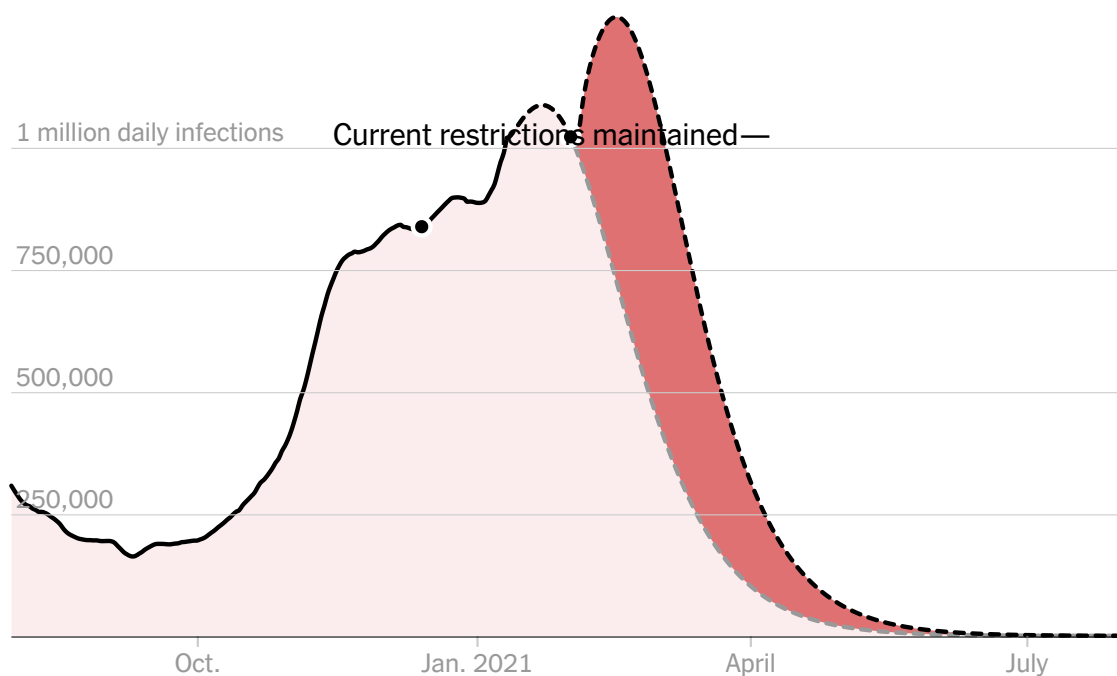
“There are people who are going to want to relax the controls we have in place,” Dr. Shaman said. “If we start thinking, ‘We’ve got a vaccine, there’s a light at the end of the tunnel, we can stop in a couple of months’ — that’s way too soon.”

The coming months are critical in the race to reduce new infections and deaths, since there will ultimately be fewer people for the virus to infect as the pandemic drags on.

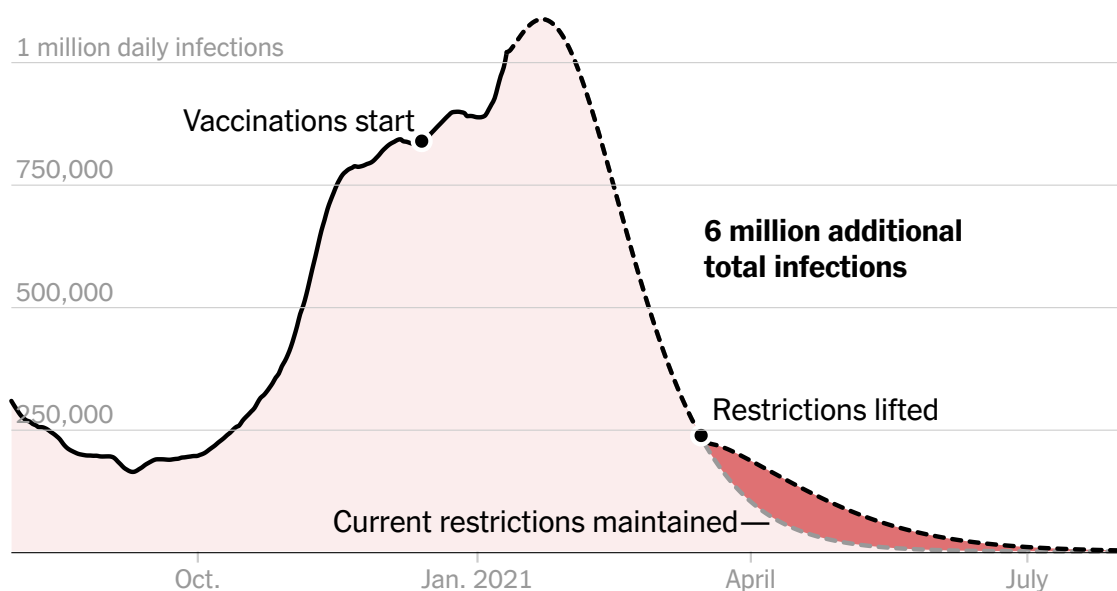
Lifting restrictions in early February, after most health care workers and nursing home residents are set to be vaccinated, would still mean far more infections in the long run than keeping restrictions in place until mid-March, for example.

If restrictions are lifted in February





If restrictions are lifted in mid-March



Even with current precautions, some areas of the country have let the pandemic rage so uncontrollably that it is too late for the vaccine to have a major impact, Dr. Shaman said. His group estimates that 60 percent of the population in North Dakota has already been infected. Vaccines will help, but the pandemic will mostly burn out on its own, as fewer and fewer people are available to infect, he said.

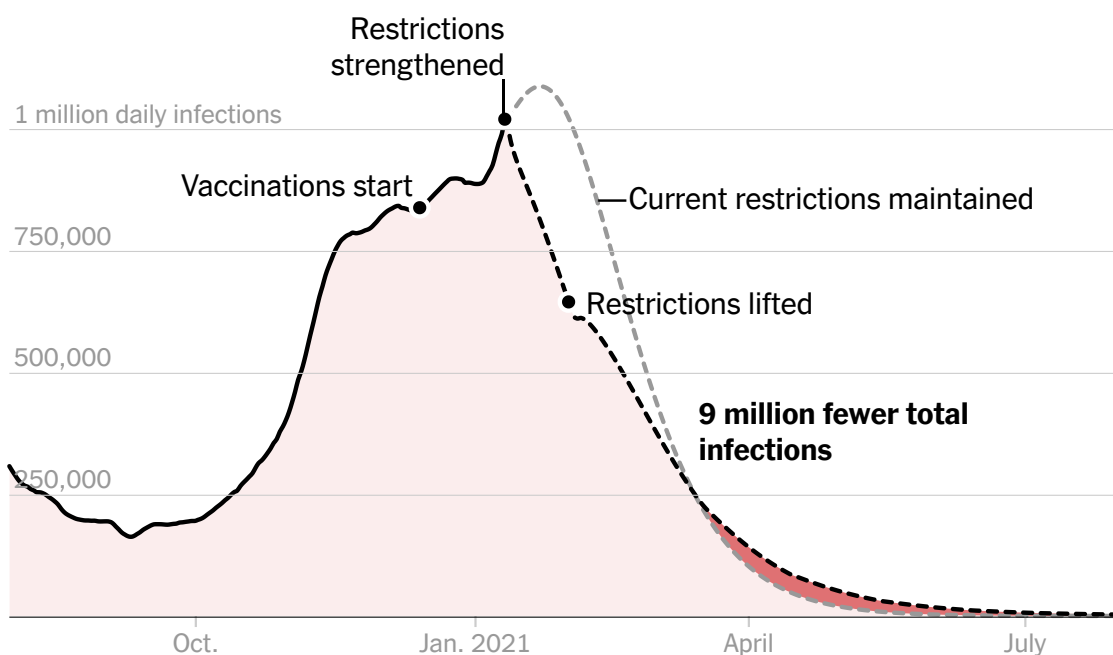
On the other hand, in Vermont, with roughly a 10 percent infection rate, the vaccine could protect nearly the entire population if it is deployed quickly enough, Dr. Shaman said. California is teetering somewhere in between as new outbreaks take place.

The model takes into account factors like the speed and order of vaccine distribution, the effectiveness of the vaccine after one and two doses, current social distancing measures and the transmissibility of the virus. It assumes that groups like health care workers and older adults will be prioritized according to C.D.C. guidelines, and vaccination will continue at a pace ramping up to five million doses per week.

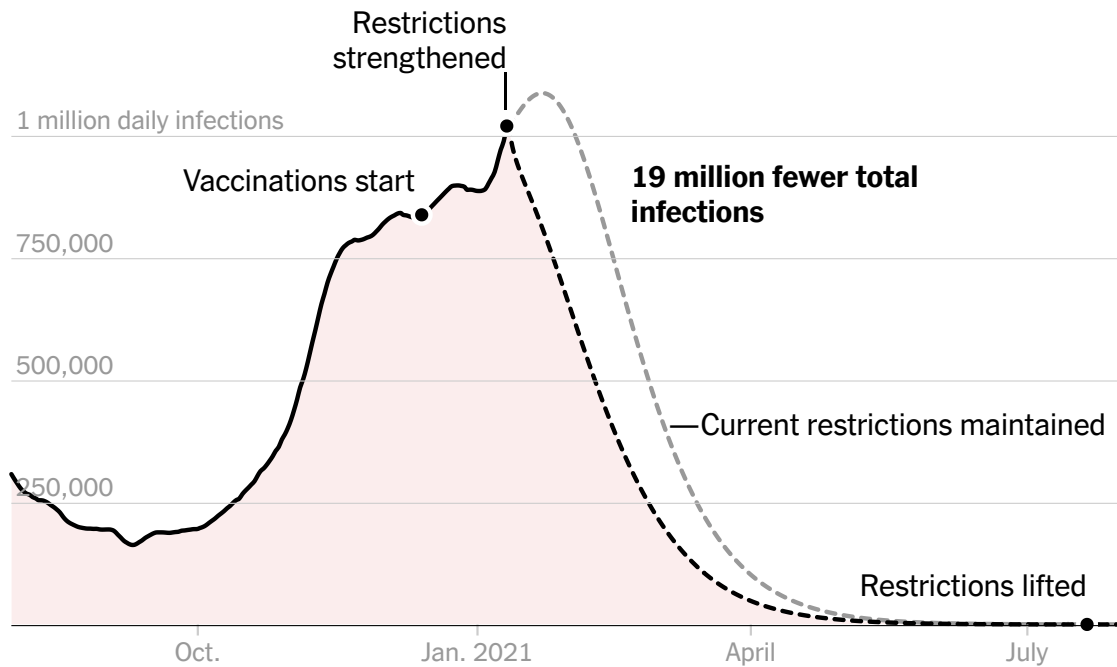
The group considered scenarios in which current social distancing measures were relaxed earlier or later in the vaccine rollout, and what might happen if they were strengthened. The research was financed by Pfizer, one of the vaccine makers, as well as the National Science Foundation and the Morris-Singer Foundation.

Of the scenarios the researchers examined, those in which restrictions were strengthened and then kept in place until much of the population could receive the vaccine resulted in some of the fewest total infections.

If restrictions are strengthened until February



If restrictions are strengthened until late July



Other researchers said they agreed with Dr. Shaman's broad conclusions, although the model involves a number of approximations, and it has not yet been published or subjected to formal review.

The finding "passes the gut check," said Trevor Bedford, a geneticist at the Fred Hutchinson Cancer Research Center and the University of Washington. He said the pace of vaccine rollout was an unknown that could change the conclusions. The Biden administration has said it intends to accelerate distribution, but those assertions have yet to be tested.

Dr. Bedford also cautioned that a new variant of the virus that recently emerged from the United Kingdom and that is believed to be more transmissible than others circulating in the United States "could cause more of a spring wave than what was modeled here."

Lauren Ancel Meyers, a professor of biology and statistics at the University of Texas at Austin, said that Dr. Shaman's reasoning "all makes intuitive sense." Dr. Meyers said she agreed that the uncontrolled outbreaks in many places in 2020 have lowered the benefits of a vaccine.

“Unfortunately, we've let this virus spread extensively and are launching the vaccination campaign at the height of the threat,” Dr. Meyers said. “The more the virus spreads before the vaccine reaches people, the fewer deaths we can prevent with the vaccine.”

Dr. Meyers added, though, that mortality figures could come down sooner than infections with the right vaccination strategy, perhaps allowing some parts of the country to open up more quickly than expected. That depends on highly exposed frontline workers and those who are most at risk of death getting vaccinated quickly, she said.

“We may get to the point where, even though the virus is still spreading, it's just less deadly on a population level and policymakers feel comfortable relaxing some of the measures we now have in place to protect our health care systems and save lives,” Dr. Meyers said.

Over all, the findings are probably unwelcome news for millions of people who would like to return to normal life, from a guilt-free night out at a restaurant to chatting about football scores at school dropoff, as soon as possible.

Policymakers who will have to lay down and sometimes enforce those restrictions in 2021 are already aware of the long haul still ahead, said Mayor Jenny A. Durkan of Seattle in an interview.

“I think that the modeling is absolutely credible,” said Ms. Durkan, who has received praise for incorporating science into her own policy decisions. The mayor said she was preparing Seattle to continue social distancing measures “at least through the summer and probably into the fall.”

“It's just human nature to hope,” Ms. Durkan said. “I think that people thought that if there was a vaccination that it would be safe to gather again, and it's not.”

Vaccinating people provides collective protection because the virus spreads by hopping from person to person. If the virus encounters someone who cannot catch the disease, that eliminates a path to infect someone else.

For simplicity, in his team's models, Dr. Shaman assumed that neither those who have recovered from the disease nor those who receive vaccinations could develop it or pass it on again. He took the effectiveness of the vaccine to be 95 percent after the two standard doses for the vaccines available now.

All models incorporate certain approximations, and Dr. Bruce Y. Lee, a professor of health policy and management at the City University of New York, said that scientists would be cautious in using the new calculations to determine precisely when the disease is likely to subside. Dr. Lee said that his own modeling determined that the virus could drop to much lower levels by July.

That condition, sometimes referred to as “herd immunity,” does not mean the disease has been eradicated, Dr. Lee said. “Reaching the threshold of herd immunity means there are additional protective effects from people around you being immune to something,” Dr. Lee said.

Susceptible people can still get the disease once herd immunity has been achieved, said David Engelthaler, who leads the infectious disease branch of the Translational Genomics Research Institute in Arizona. Case numbers, however, are no longer growing exponentially, and they may stay relatively constant, he said.

“You’re not going to wipe this thing out by achieving herd immunity; clusters and spikes continue to occur,” Dr. Engelthaler said.

Still, he said, growth will inevitably slow and stop — in his view, a bit earlier than some other researchers are projecting. He said the combination of immunity from vaccines and infection could begin reining in the pandemic by late spring or early summer.

“Then we can start thinking about normal civilization again,” Dr. Engelthaler said.

The data presented here comes from a team led by Marta Galanti and Jeffrey Shaman at Columbia University.

The model assumes a vaccine efficacy of 90 percent 10 days after the first dose and 95 percent one week after the second dose — and that those vaccinated will ultimately receive both doses. The model also assumes a vaccination schedule following the C.D.C. guidelines for different groups, followed by a distribution ramping up to five million doses per week of other adults and children.

Historical case data is used to estimate the number of past infections and effective reproduction rate in each state as of Jan. 10, 2021. Infection projections are based on the virus having a basic reproduction number of 2.4 without any nonpharmaceutical interventions, including social distancing restrictions.

In each scenario, restrictions are fully relaxed at the date indicated, except those in which restrictions are strengthened. In these scenarios, restrictions are gradually relaxed over the following months. For scenarios in which restrictions are strengthened, the basic reproduction number is lowered to 1.5.

Covid-19 Vaccines ›

Words to Know About Vaccines

Confused by the all technical terms used to describe how vaccines work and are investigated? Let us help:

- **Adverse event:** A health problem that crops up in volunteers in a clinical trial of a vaccine or a drug. An adverse event isn't always caused by the treatment tested in the trial.
- **Antibody:** A protein produced by the immune system that can attach to a pathogen such as the coronavirus and stop it from infecting cells.
- **Approval, licensure and emergency use authorization:** Drugs, vaccines and medical devices cannot be sold in the United States without gaining **approval** from the Food and Drug Administration, also known as **licensure**. After a company submits the results of clinical trials to the FDA for consideration, the agency decides whether the product is safe

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