

Why kids hold the key to herd immunity

April 1 2021, by Eva Botkin-Kowacki



Credit: Hannah Moore/Northeastern University

To win the battle against the pandemic, kids will be vital.

The fight against COVID-19 has long been focused on adults—particularly older adults. But kids are becoming a more prominent part of the conversation. We likely won't see an end to the

pandemic, experts say, until children can get vaccinated.

On Wednesday, Pfizer and its partner BioNTech announced the results of its [coronavirus vaccine trial in adolescents](#) 12 to 16 years old. It's safe and effective in that age group, the company reported. The Pfizer-BioNTech vaccine currently is approved for emergency use by the FDA for ages 16 and up, and extending use to that younger age group will take a separate approval process. In March, both Pfizer and Moderna announced that they have begun trials of their respective COVID-19 vaccines in children under the age of 12 and as young as six months. Moderna also has a [vaccine trial](#) underway in adolescents.

"Children and adolescents will play a key role in ultimately closing that last part of the gap to help us emerge from this pandemic," says Neil Maniar, associate chair of the Department of Health Sciences at Northeastern.

It mostly comes down to the numbers needed for herd immunity, Maniar says. Children make up [22.1 percent of the US population](#), and, given that some adults won't get vaccinated because of vaccine hesitancy or underlying conditions, that is a significant portion of the [population](#) that still could be contracting and transmitting the virus that causes COVID-19.

The relative importance of immunizing children depends in part on how we define [herd immunity](#) and a return to normal, says Samuel Scarpino, assistant professor in the Network Science Institute at Northeastern, where he directs the Emergent Epidemics Lab.

If the goal is simply to limit the risk of significant outbreaks that spread quickly through a population, while maintaining social distancing measures and mask-wearing, then about 40 to 50 percent of the population needs to have immunity from vaccination or past illness, he

says.

"Once we get to that 40, 50 percent vaccinated, populations will be heavily buffered against an epidemic," Scarpino says. "But it doesn't mean that we can't have really big outbreaks, it doesn't mean that things can't spiral out of control."

The idea behind that level of immunity in a population would be to reduce the possibility that infection could spread like wildfire among communities as lockdowns lift and social distancing measures remain. But, Scarpino says, if people want to yank off their masks and rejoin crowds safely, it might take more.

"What that means is that if an outbreak gets started, you could end up with 20 to 30 percent of the population getting infected. And 20 to 30 percent of the population, that's the size of the wave we just had, this huge epidemic that we just had," Scarpino says. "So instead, I think it's probably better for us to think about a 'we're safe' threshold, which is once you get, say, 80 percent of the population vaccinated."

Some experts have said that it could take around 80 percent of a population having immunity from vaccination or infection to reach that level of public health protection for a more significant return to normal, while others say it could require as much as 90 percent of the population to be immune. The complications arise from scientific debate, as well as questions about human behavior and the size of social circles.

"Once you move out of the math and into the real world" the immunity threshold gets more complex, Scarpino says. If people want to go back to Fenway to catch a ballgame packed into the stands with thousands of mask-less strangers, for example, that will require a much higher percentage of the community to be vaccinated to prevent the spread of the virus than if we stick with small gatherings in consistent social

circles. The safe threshold of immunity will change as social behavior shifts and people mix more.

If the goal is a total return to pre-pandemic activities, he says, vaccines for children will be essential to reach those numbers—even if all eligible adults get vaccinated. And that seems unlikely to happen, despite efforts to allay vaccine hesitancy.

Another wrinkle has emerged recently: variants of the virus. In particular, the variant that was first detected in the UK, dubbed B117, has been found to spread in a population much more easily. About 50 percent to 60 percent more infections can result from a single infected individual than the original variant of COVID-19, Scarpino says. That changes the math for younger [age groups](#).

While the risk of an outbreak has long seemed to be lower among children, the B117 variant raises the risk significantly. That pulls that population up to a level of risk that could yield sustained epidemics among that age group.

"Even pre-B117 we needed to vaccinate the younger age groups," Scarpino says. "But now that we're in the B117 era, it's going to be harder to reopen school safely. It's going to be hard to reopen anything safely until we can start vaccinating these kids."

Trials have been underway for vaccines in children ages 12 and older since earlier this year. It's unclear how long the FDA will take to announce its decision about approving a vaccine for that age group, but with the Pfizer-BioNTech results announced on Wednesday, teens may be able to start getting vaccinated by this summer. For younger children, those trials are just getting started, so vaccination is unlikely to begin before next school year.

Separate trials for kids are necessary, says Todd Brown, vice chair of the Department of Pharmacy and Health Systems at Northeastern, to figure out the best dose for children's bodies. "We want to stimulate the immune system, but we don't want to overstimulate it," he says.

In the meantime, states and [school districts](#) have begun pushing to return students to in-person learning, citing concerns over children's development without the in-person interactions of a day in school. Massachusetts, for example, is compelling school districts to move entirely back to in-person learning later this spring and has launched a pooled testing initiative in schools across the Commonwealth to support that mandate, supported by Northeastern's COVID-19 testing facility. The Biden administration also announced an investment of \$122 billion to support preK-12 schools returning to in-person learning safely, which will largely go toward COVID-19 testing and tracing.

"Testing is a key part of the process to keep everyone in the school environment safe, not just the kids, but the faculty and the staff and the administration," Maniar says. He also emphasizes the importance of continued mask-wearing, practicing good hygiene, and adhering to the CDC guidelines for social distancing. (For children in K-12 schools, those guidelines were just [revised to three feet apart](#) while masked and sitting at desks in the classroom. The six-feet edict remains for other contexts.)

These protective measures along with the test, trace, and isolate approach can help keep a community from having an outbreak of COVID-19 even in the absence of vaccination, Scarpino says. He points to how that has been successful in the Northeastern community, despite the recent uptick in cases.

"With a combination of the vaccines, physical distancing, mask wearing, etc. – and the warmer weather is going to make that easier—we can get"

to something resembling normalcy, Scarpino says, perhaps even by the summer, if enough people get vaccinated and maintain social distancing in the face of the current surge. "I think this summer is going to feel pretty normal for a lot of people."

Then, to return society to a more fully normal state, he says, "We continue to vaccinate, we get to 60, 70 percent of adults vaccinated. Then we start vaccinating the teenagers, we get 60 to 70 percent of them vaccinated, so by the time we roll into the fall, we've got 60 or 70 percent of the whole population vaccinated. Then maybe at that point in time, we've got emergency-use authorization for the last group of kids. And hopefully by respiratory season, we could get to the 'we're safe' threshold."

Whether or not a COVID-19 vaccine is available to children by the fall, Maniar says if enough adults have gotten vaccinated, it could make a difference in reducing transmission of the virus in our communities. "Every person that gets vaccinated is going to make an important contribution to helping us all get out of this," he says.

Provided by Northeastern University

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