



<https://www.nationalgeographic.com/science/2020/12/we-now-know-how-much-children-spread-coronavirus.html>

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SCIENCE CORONAVIRUS COVERAGE

Exclusive: Kids catch and spread coronavirus half as much as adults, Iceland study confirms

Big decisions around COVID-19 and children have been heavy on politics and short on science. New large-scale studies are changing that.

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In the midst of the worst surge of COVID-19 cases in the United States, many state and local officials are again wrestling with the hot-button issue of whether to shut schools down. Now, emerging research confirms that schools aren't the primary drivers of outbreaks, but cases will seep in and contribute to the disease's spread whenever a country loses control of containing the pandemic.

National Geographic was given exclusive access to the results from an Icelandic study that provides definitive evidence of how much children contribute to coronavirus spread. Researchers with the nation's Directorate of Health and deCODE genetics, a human-genomics company in Reykjavik, monitored every adult and child in the country who was quarantined after potentially being exposed this spring, using contact tracing and genetic sequencing to trace links between various outbreak clusters. This 40,000-person study found that children under 15 were about half as likely as adults to be infected, and only half as likely as adults to transmit the virus to others. Almost all the coronavirus transmissions to children came from adults.

"They can and do get infected and transmit to others, but they do both less frequently than adults," says Kári Stefánsson, the chief executive of deCODE.

This analysis is one in a recent flurry of large-scale studies that support the conclusion that infected adults pose a greater danger to children than kids do to adults. These studies could help inform officials who are struggling to decide when, or if, to close schools, knowing that such shutdowns are harming children. In addition to vital academic lessons, schools provide many critical services to communities, so last week, the U.S. Centers for Disease Control and Prevention recommended that schools should be both "the last settings to close" and "the first to reopen."

But even if children are generally less susceptible, when infection surges in a community, the risks in schools can dramatically increase. With the U.S. failing to contain the virus on a national level, American K-12 schools have reported more than 313,000 COVID-19 cases as of December 10.

The kids are alright, unless ...

Whether an infectious disease spreads in schools depends on two factors: how often children get infected with the coronavirus, and how easily they transmit the disease to others. If kids were to be both very susceptible and highly infectious, schools would likely drive new outbreaks of COVID-19, as they do with influenza. But if children are poor catchers and slight spreaders, schools should simply mirror what's happening in the wider community.

Before this fall, though, coronavirus data involving children were scarce, mostly because U.S. schools had closed so early in the pandemic. In addition, the research that emerged over the summer often had limitations.

The best way to understand how transmission might occur between children and adults would be to constantly monitor healthy families with school-age children to see if they get infected. By testing frequently, scientists would catch infections as they occur, making it clear who got sick first.

Iceland and deCODE put this into practice by conducting comprehensive testing and tracing, screening more than half the country's population: Anyone who was potentially exposed was quarantined, sealing them off from the community, but often exposing their families. By looking at the difference between adults and children in these quarantines, deCODE found that children play a minor role in transmission.

Iceland never closed its elementary schools, although it did close its high schools at the peak of its first surge. Data from its wave in September support the idea that younger children are less likely to get sick or to infect others. Stefánsson is in the process of publishing these results in a peer-reviewed journal, but he says the meticulous dataset is conclusive for Icelandic transmission—"and we have turned out to be a reasonable animal model for the human population."

Stefánsson cautions that if everything but schools and childcare centers are closed, children would then become one of the primary sources of transmission. He explains that while the individual risk might be low among youths, schools will still have outbreaks.

That means the question becomes not a scientific one, but rather what level of risk society is prepared to accept to keep children in school: "What are you willing to live with?" he asks.

Don't treat all ages the same

In addition to the Iceland study, other research has shown that pre-pubescent kids have a significantly lower likelihood of getting sick. So, school officials need to make a distinction between younger children and adolescents.

One recent large-scale study on how to stop viral spread cements this conclusion. When the COVID-19 epidemic was just weeks old, thousands of people in China traveled to celebrate the Lunar New Year. In Hunan—a province adjacent to where the coronavirus was first discovered—the government set up travel screenings and contact tracing. Using data from these checkpoints, researchers analyzed 1,178 infected people and their 15,648 close contacts.

Their results, published in *Science* in late November, show that children under the age of 12 were less likely to contract the disease after an exposure than adults, says study co-author Kaiyuan Sun, a research fellow at the Fogarty International Center of the U.S. National Institutes of Health. The study also found that the risk of transmission within households, especially during lockdown, was much higher than between more casual contacts, like those made in school. When positive cases were isolated and their contacts quarantined, transmission chains were broken. This suggests that smart interventions could help halt wider outbreaks, including in schools.

Many other studies agree that age matters. One recent preprint tracked 4,524 people from 2,267 houses in Geneva, Switzerland, from April through June. The researchers found that children from 5 to 9 were up to 22.7 percent less likely to be infected, and that their risk increased with age.

The takeaway is that a critical shift appears somewhere between the ages of 10 and 12. Around the time of puberty, the risk of teenagers both getting and transmitting the virus increases. The COVID Monitor, a group tracking information from more than 7,000 U.S. school districts, found that high school case rates are nearly three times that of elementary schools.

It's still unclear why that might be the case. One theory is that children are more frequently exposed to coronaviruses, conferring some protection. Another is that children have fewer ACE2 receptors, a target of the coronavirus, in their upper airways. Still another theory is that their smaller lungs aren't as good at projecting droplets or generating aerosols.

Despite this distinction, children and teenagers often get lumped together in disease reporting, which Alasdair Munro, a clinical research fellow in pediatric infectious diseases at University Hospital Southampton in Britain, says, "is extremely problematic."

But transmission is not based only on biology. Behavior plays a role, too. In November, a study in India on half a million people found "patterns of enhanced transmission risk" in children under 14, including many instances in which children were infected by other children.

"If a school opens, children make contact much more frequently than adults," Sun says. His analysis also confirmed the CDC's estimation that presymptomatic transmission accounts for about 50 percent of infections—meaning it's not always possible to isolate people before they can get others sick. This is why schools will always pose some level of risk.

When do schools need to close?

Because countries have taken different approaches to schools, the world has inadvertently designed a natural experiment on their exact role in COVID-19 transmission.

In the U.K., a new paper published in *The Lancet* found that partial school reopenings this summer were associated with a low risk of cases; out of more than 57,000 schools and nurseries, the study found just 113 cases associated with 55 outbreaks. These cases were correlated strongly with local infection rates, showing how important it is to reduce community transmission to keep schools safe. "Transmission will occur in schools, just as it will anywhere that people mix," Munro says. "But children aren't the drivers of disease." Instead, it's increasingly clear that in many countries, it's people in their 20s and 30s who spark outbreaks that then spill over into both older people and children.

Data from Germany echoes these conclusions. Scientists recently tested thousands of children in Bavaria for antibodies, and found that six times as many children as expected had them—suggesting many children's cases are being missed. But few of these cases have caused wider outbreaks. The country has also collected data from its 53,000 schools and daycares; even this fall, as community cases surged, an average of 32 schools a week have had more than two positive cases. Susanne Kuger, the director of the Center of Social Monitoring with the German Youth Institute, says that often "it's adults transmitting disease, even in childcare settings," as parents drop kids off, or staff mingle in a break room.

(Related: Millennials and Gen Z are spreading coronavirus—but not because of parties and bars)

Germany has also taken many additional measures to support parents, like increasing the number of sick leave days so that parents can stay home longer if children get sick. These steps are critical, Kuger says, because "parents transmit fear and worries onto their child. The more stressed parents are, the more stressed the child is."

Uneven consequences

After months of remote learning, it's abundantly clear to both teachers and parents that closing schools does its own harm. There have been many reports of increased mental health concerns, domestic violence, and possibly even years of life lost due to decreased learning. That's why Fiona Russell, director of the Child and Adolescent Health Ph.D. Program at the University of Melbourne in Australia, says, "Schools should absolutely be the first priority to open, and the last to close. They need to be prioritized."

That doesn't necessarily mean instantly re-opening schools without first taking other measures to control community spread. The state of Victoria, for example, took a very conservative approach to lockdowns. Home to 6.5 million people, the state didn't reopen until there were fewer than 10 total COVID-19 infections. Russell says schools were closed not because they're inherently dangerous, but to prevent the movement of people.

Brett Sutton, Victoria's Chief Health Officer also said that in retrospect, the state would not have closed schools. Partly thanks to his advice, Ireland left its schools open during the most recent lockdown while closing gyms, churches, restaurants, and non-essential businesses. Nevertheless, community infections have declined by 80 percent in six weeks.

"Our priority to keep the virus out of schools," Russell says, "is to keep it out of the community."

In the U.S., President-elect Joe Biden has said that re-opening schools will be a priority in his first hundred days in office, but communicating clearly about the science—and being real about the unequal risks of the virus based on race and income—will be important to building trust with parents as schools attempt to re-open.

Kaliris Salas-Ramirez, a neuroscientist at the CUNY School, is a single mom who has decided to keep her nine-year-old home from his school in New York City's District 4. "There are so many other things that already put my Black son at risk," she explains, citing the existential dangers of institutionalized racism. "Black and brown families don't have the luxury of choosing to put our children's lives at risk."

Government missteps and mixed messaging over the pandemic have already widened racial disparities in education. A recent survey in Massachusetts found that Black, Latino, and lower-income families are far more likely to have a child in remote learning this fall, a trend seen across the country. These choices are intentional and reflect a logical consideration of the disproportionate risk: The majority of children who've been infected and killed by the coronavirus fall into these racial and ethnic groups. Meanwhile, private schools are more likely to be open for in-person classes.

"I don't want to put myself, my kids, or their teachers in harms' way," says Naomi Pena, a woman of color and a member of the Community Education Council for District 1 in New York City. She's watched multiple friends die from COVID-19. So Pena chose to keep her teenagers home, although one of her children has learning disabilities. Like Pena, around 60 percent of families in District 1 have decided to have their children learn remotely.

As scientists finally begin to reach consensus on how safe schools are, school boards will need to not only make evidence-based plans, but better communicate what steps they are taking to keep kids and communities safe.