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Should schools reopen? Kids' role in pandemic still a mystery [1]

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EXCERPTS

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For families eager for schools to throw open their doors, the tale of a 9-year-old British boy who caught COVID-19 in the French Alps in January offers a glimmer of hope. The youngster, infected by a family friend, suffered only mild symptoms; he enjoyed ski lessons and attended school before he was diagnosed. Astonishingly, he did not transmit the virus to any of 72 contacts who were tested. His two siblings didn't become infected, even though other germs spread readily among them: in the weeks that followed, all three had influenza and a common cold virus.

The story could be a bizarre outlier—or a tantalizing clue. Several studies of COVID-19 hint that children are less likely to catch the novel coronavirus, and don't often transmit it to others. A recent survey of the literature couldn't find a single example of a child under 10 passing the virus on to someone else, for example.

Relying on those encouraging if scant data—and the reassuring knowledge that very few children get severely ill from COVID-19—some governments are beginning to reopen schools. Denmark sent children up to age 11 back on 15 April, and Germany welcomed back mostly older children on 29 April. Some Israeli schools reopened on 3 May; the Netherlands and the Canadian province of Quebec plan to reopen many primary schools on 11 May. The steps are tentative; most schools are resuming with reduced class sizes, shortened school days, and extra handwashing.

Ending school closures has clear benefits for children's education and mental health—not to mention their parents' well-being—but scientists disagree about the risks. Some worry that even if children transmit less efficiently than adults, they may make up for it by their far more expansive web of contacts, especially at school. "From the data we have so far, it is very dangerous to open schools and day cares at the moment," says Marco Ajelli, an epidemiologist at the Bruno Kessler Foundation in Trento, Italy.

Several new studies now underway aim to better gauge the risk, including one announced on 4 May by the U.S. National Institutes of Health (NIH) that will follow 2000 families for 6 months. "We need this information to safely plan for return to school and work and play," says Catherine Birken, a pediatrician and researcher at the Hospital for Sick Children in Toronto. "Without it, we're completely in the dark."

As parents and teachers know all too well, children excel at catching and sharing germs, from influenza to common colds, even when they don't feel very sick themselves—think of the 2-year-old unbothered by her runny nose all winter. "Respiratory viruses really like children," says Isabella Eckerle, a virologist at Geneva University Hospitals.

COVID-19 may be different, but the evidence has been slow to come in, for several reasons. Once schools are closed and children cocooned with their nuclear families, it's tough to study how efficiently the virus can pass through crowds of young people or from young people to adults. Virus tests are in short supply and often reserved for patients and health care workers, who need them more than children who might harbor the virus without showing symptoms. And to catch transmission events in real time, researchers need to follow many children, which is not easy to do. "It's a lot of lucky timing and hard work," says Natalie Dean, a biostatistician at the University of Florida.

The evidence from studies done so far is not consistent. Researchers in Iceland, one of the few countries to conduct mass screening, turned up no infections in 848 children under the age of 10 without significant symptoms, compared with an infection rate of nearly 1% in ages 10 and older. A U.S. analysis of nearly 150,000 infected people found that just 1.7% were under age 18. But a study of 391 cases and almost 1300 close contacts in Shenzhen, China, reported that children were just as likely to be infected as adults. Eckerle cautions that some of these data come from surveys done after shutdowns were put in place. "They were collected in an artificial situation," she says. Children "weren't going to the playground and were not going to school."

Several studies suggest children who get sick with COVID-19 are just as infectious as ailing adults. Researchers have detected the same amounts of viral RNA in nose or throat swabs from sick children as in those from older patients. Finding RNA does not always mean a person is infectious; it can also come from noninfectious viral remnants. But in a 1 May preprint, Eckerle's team reported that 12 out of 23

children sick with COVID-19 had the virus in their nose or throat able to attack and infect human cells in the lab, a rate similar to adults.

Far less is known about the risk posed by infected children with few or no symptoms. But there's at least one example of a child who didn't appear sick and was nevertheless a virus factory: In February, doctors in Singapore described a 6-month-old baby, infected without apparent symptoms, whose coronavirus levels were on par with sick adults.

Real-life studies of how often children transmit COVID-19 are scarce. Researchers at the Dutch National Institute for Public Health and the Environment (RIVM) looked carefully at how the disease spread in 54 households, together comprising 123 adults and 116 children aged 16 or younger. They didn't find a single family in which a child was the first patient. This study, too, began only after schools closed, says RIVM epidemiologist Susan van den Hof, but there's additional evidence from Dutch contact tracing studies: Of 43 contacts of infected children and teens who were followed, none became infected.

Critics have noted these numbers, posted on RIVM's website, are too small to be statistically significant. But combined with other studies, Van den Hof says, "The data all seem to be pointing in the same direction: that there is not as much transmission from children." That helped convince the Dutch government to reopen elementary schools—and allow children's sports teams to practice—starting next week.

Ajelli, who thinks such moves are premature, teamed with colleagues in China to estimate the effects of school closures and other social distancing measures in Shanghai and Wuhan, China. Based on contact surveys, which ask subjects how many people they typically meet during school or workdays and on the weekend, the team found that children have approximately three times as many contacts as adults. Although they were only one-third as likely to be infected, keeping children at home helped curb the outbreak in China, the team concludes in a paper published online by Science on 29 April. Reopening schools will likely accelerate transmission, Ajelli cautions.

To pinpoint the role of children, Birken and Jonathon Maguire at St. Michael's Hospital, also in Toronto, plan to scrutinize transmission as it happens. They have begun to recruit 1000 families, all of them part of an ongoing children's health study in the region, for weekly nasal swabs, symptom checklists, and queries about day-to-day family life. Were children biking with friends? Did parents go to the grocery store? Birken also hopes to see what happens as school closures and other restrictions are lifted. The NIH study has a similar setup and draws from existing pediatric research projects in 11 cities. Another study is ongoing in the Netherlands.

"Doing studies as schools reopen will be really important," says infectious disease specialist Susan Coffin of the Children's Hospital of Philadelphia, who is planning one herself in her hometown. It would include regular testing of children, staff, and teachers, along with other members of students' households. Coffin hopes to trace contacts and sequence the virus from individual patients, which can help clarify who transmitted it to whom.

The countries reopening schools may soon provide a reality check. If children are ample virus spreaders after all, cases could surge in a matter of weeks. And if they aren't, parents and policymakers will heave a sigh of relief and more countries may follow. For now, the natural experiment proceeds. "Everyone is looking at each other," Van den Hof says, "to see what will happen" next.

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