

# IS IT SAFE TO REOPEN SCHOOLS?

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*School reopening decisions should reflect evidence-based estimates of the risks associated with reopening schools and the risks associated with keeping schools closed. Experiences from countries around the world where schools have reopened suggest that with adequate mitigation strategies, schools pose low risks for disease transmission among students, staff, and communities. Available evidence suggests that young children are less likely to contract COVID-19, less likely to become seriously ill or die and less likely to transmit the disease to others. Transmission within schools has been low, particularly for preprimary and primary schools, and staff in schools are more likely to get the virus from other staff, not from students. Given the safe reopening experiences in countries prior to vaccine development, often in the midst of high community transmission, education systems do not need to wait for widespread vaccination of school staff or other adults in the community before reopening, although prioritizing school staff for vaccination may allay fears of returning to schools for in-person instruction. Keeping schools closed eliminates the risk of disease transmission at school, but it also imperils children's learning, psychosocial health, and overall development.*



As the COVID-19 pandemic spread within and across countries at the start of 2020, we knew very little about the virus: how it spread, who would be most affected, and how to treat it. To protect children and slow disease transmission, most governments reacted by closing schools. The COVID-19 pandemic led to a global shut down of schools in more than 188 countries, leaving 1.6 billion children—75 percent of enrolled students—out of school. One year later, we know much more about both the virus and the disease and how to mitigate transmission (see [Minimizing Disease Transmission in Schools](#)), and health authorities like the WHO recommend school closures only as a “last resort.” According to the [COVID-19 Global Education Recovery Tracker](#), as of July 2021, 80 percent of schools worldwide are in regular session. Out of those, 54 percent are back to in-person instruction, 34 percent are relying on mixed or hybrid instruction while 10 percent continue remote instruction and 2 percent offer no instruction at all ([Johns Hopkins University, UNICEF and World Bank, 2021](#)).

Schools have remained closed where governments, communities, teachers, or parents fear that reopening schools poses too great a risk for disease transmission. In each context, it is important to quantify the risks associated with reopening schools, as well as the risks of keeping schools closed, so that reopening decisions can be based on risk assessments informed by evidence. In particular, we need evidence for both students and school staff on their susceptibility of getting COVID-19 and the ease of transmitting the disease to others, and whether reopening schools contributes to the spread of COVID-19 within communities. Finally, we need to quantify the losses associated with school closures. A year and a half into the pandemic, such evidence is increasingly available, suggesting that the costs of school closures far exceed the risks associated with opening schools with adequate mitigation strategies in place.

## The Risk for Children

Data from population surveillance studies and contact tracing studies suggest that in comparison to adults and adolescents, young children, particularly those under the age of ten, are considerably less susceptible to contracting COVID-19 and much less likely to transmit the disease. Multiple studies conducted during the pandemic suggest that the incidence rate among children and adolescents is lower than among adults ([Goldstein, Lipsitch and Cevic 2021](#); [Zhu et al. 2021](#); [Viner et al 2021](#)). In representative samples collected early in the pandemic (first quarter of 2020), children under age ten tested positive in 0.0, 0.0 to 3.5, and 0.0 percent of the time in [Italy](#), [Spain](#), and [Iceland](#)<sup>1</sup>, respectively, in contrast to children older than ten, who tested positive 1.2, 4.0 to 4.2, and 0.8 percent of the time in these countries. Children under ten represented less than one percent of diagnosed cases in South Korea in the early part of the pandemic. Data from [National COVID-19 School Response Dashboard in the United States](#) also suggest very small infection rates. In May 2021, when around 62 percent of the 12.2 million students covered in the database were attending in-person instruction, the student infection rate was 0.11 percent, which includes infections acquired both by students attending school remotely and those attending in person.



Among children who do get COVID-19, severe illness and death are rare and most commonly occur among children with other underlying illnesses. While several underlying conditions have been associated with child hospitalization from COVID-19, a study from the United States show that children with type 1 diabetes, obesity and cardiac conditions were most at risk ([Schuster and de St Maurice 2021](#)). In addition, trauma, anxiety, and depressive disorders were also associated with hospitalization for COVID-19. Children with complex chronic diseases were nearly eight times more likely to be hospitalized and three times more likely to have severe disease than children with no chronic diseases. According to the American Academy of Pediatrics and Children’s Hospital Association, child cases in the United States have resulted in hospitalization at a rate of between 20-190 per 10,000 cases, depending on state. Only

1. In the case of Iceland, among children under ten years old who were either symptomatic themselves or in contact with an infected person, 6.7 percent tested positive for COVID-19.

between 0 and 3 child cases in 10,000 have resulted in death ([Cull and Harris 2021](#)). In a contact tracing study in two states in India ([Laxminarayan et al. 2020](#)), 5 in 10,000 confirmed cases resulted in death among children aged five to seventeen years. In comparison, death occurred at a rate of 130 in 10,000 cases among 40- to 49-year-olds and 1,660 in 10,000 cases among people over the age of 85. A preliminary study from England, utilizing data from March 2020 to February 2021, confirms that the risk of children dying from COVID-19 is extremely low. In the study, which is the largest conducted to date, the researchers found that only 25 children died from COVID-19, among 469,982 children and young people who tested positive for COVID-19 in England during the first year of the pandemic ([Smith et al. 2021](#)). Put differently, 99.995 percent of children who tested positive for the virus survived. The data indicate an overall mortality rate of two children in a million. In line with previous findings, most of the deaths were older children with underlying illnesses and conditions.

Although children are efficient spreaders of other respiratory illnesses like influenza or the common cold, a [summary](#) of large-scale epidemiological surveys and smaller analyses of household clusters indicates that they appear to transmit COVID-19 less effectively than adults. Evidence from reopened schools is consistent. According to the [Public Health Agency of Sweden \(2020\)](#), the incidence of COVID-19 among children under the age of nineteen in Sweden was similar to the incidence among the corresponding cohorts in Finland, even though Sweden had a disease incidence in the population that was five times higher than Finland's and had kept schools open while Finland had kept them closed. An analysis of infection clusters and outbreaks in the United Kingdom found that incidence rates were lowest among primary school students and that the most common direction of transmission was staff to staff ([Ismail et al. 2021](#)). Similarly, a study in Germany ([Schoeps et al. 2021](#)) found that when infections were surging within the community, and when children over age ten were physically distanced in school more than 1.5 meters and children under ten had no minimal distance to maintain, an infected student led to an average of 0.04 secondary cases in teachers, while an infected teacher led to an average of 0.56 secondary cases.

On July 5th, 2021, [the WHO reported](#) that the Delta variant of the virus had been identified in 96 countries. The rapidly spreading Delta variant has increased transmissibility compared to the original Alpha variant and has been accompanied by a surge in positive cases among children. Data from the United States indicate that since the pandemic began, children represented 14.4 percent of total cumulated cases. For the week ending August 12, 2021, children represented 18.0 percent of reported weekly COVID-19 cases ([Cull and Harris 2021](#)). However, most children infected with COVID-19 still experience mild symptoms, and there is little evidence to conclude that Delta causes more severe disease in children than previous variants. According to the European Centre for Disease Prevention and Control, the surge is most likely due to an increase in confirmed mild cases among children. It is to be expected that child cases will make up a growing share of cases in the coming months in regions where many adults are fully vaccinated and subsequently benefit from increased protection from COVID-19 infection ([European Centre for Disease Prevention and Control 2021](#)).

Another concern is the prevalence of the post COVID-19 condition sometimes referred to as "long covid" in children. Studies report children diagnosed with COVID-19 experiencing symptoms such as headache, fatigue and heart palpitations, weeks after their diagnosis ([Radtke et al 2021](#); [Molteni et al 2021](#)). Further research is needed to better understand the risks associated with long covid in children.

## The Risk for Teachers and Other School Staff

Since the likelihood of contracting COVID-19 and suffering from a severe form of the disease increases with age, teachers and other school staff (such as administrative staff, janitors, food service workers, and school bus drivers) face higher virus-related risks than children at school (and in the community).



Evidence from reopened schools, however, does not suggest that schools are high-risk environments for school staff. According to the [National COVID-19 School Response Dashboard in the United States](#), the staff infection rate in May 2021 was 0.09 percent. The [European Centre for Disease Prevention and Control](#) has concluded that for adults the risk of acquiring COVID-19 within a school setting is no greater than the risk of getting it in the community or household. According to data from the [Office of National Statistics of the United Kingdom](#), the risk to female teachers in schools is equivalent to what retail and customer service workers experience at work, which is well below the risks faced by healthcare workers. Increased risk compared to working from home can be mitigated through infection control strategies. (See also guidance on [Minimizing Disease Transmission in Schools](#)).

Given the low infection rates among children and their observed limited capacity to transmit the disease, the largest risk to staff in schools appears to come from other staff in the school. In a contact tracing study in Australia, the staff-to-staff transmission rate was 4.4 percent, compared to the child-to-staff transmission rate of 1 percent. This finding means that the contacts of an infected staff member who were school staff tested positive for COVID-19 4.4 percent of the time, and the contacts of an infected child who were staff tested positive 1 percent of the time ([Macartney et al. 2020](#)). In some sense, this fact, combined with the documented efficacy of infection control strategies, should be comforting because it should be relatively easier for adults than for children to comply with mitigation strategies.

If, however, education systems or schools do not adopt the most basic mitigation measures (like masking, physical distancing, and ventilation), and health systems do not provide adequate treatment when an individual does get sick, older staff and those with underlying health conditions will face considerable risk when returning to school.

## The Risk to Communities

Determining whether schools contribute to transmission in the community is challenging to assess by infection rates, given that testing rates might increase once students and teachers return to school, and the presence of an infected individual in a school prompts contact tracing. In brief, it is difficult to assess whether school reopening reflects actual changes in transmission or changes in the frequency of testing. A recent quasi-experimental study ([Harris, Ziedan, and Hassig 2021](#)) in the United States avoid this problem by focusing on hospitalizations related to COVID-19. In counties where there were fewer than 36 to 44 new COVID-19 hospitalizations per 100,000 population per week before reopening, school reopenings did not increase COVID-19 hospitalizations, even up to six weeks afterwards. In counties with higher hospitalization rates prior to school reopenings, study results were inconclusive on whether reopenings generated an increase in COVID-related hospitalizations ([Harris, Ziedan, and Hassig 2021](#)). Another study exploited differences in start and end dates for summer and fall holidays across Germany and found that neither summer nor fall closures had any meaningful containing effect on the transmission of the virus among children or any significant spill-over effect on adults ([Bismark-Osten, Borusyak and Schönberg 2020](#)). Similarly, other studies support the argument that transmission in schools usually follows trends in community transmission, rather than preceding or increasing them ([Leidman et al. 2021](#)).

The implications of these findings are that while schools have not been associated with significant increases in community transmission, mitigation strategies to minimize transmission in schools are important to keep communities safe (See also guidance on [Minimizing Disease Transmission in Schools](#)).



# School Reopenings and Rates of Vaccination

Most of the infection and transmission rates cited above come from periods when there was limited to no distribution of vaccines among the population or within the education workforce. Given that schools that have reopened around the world have been able to effectively curtail transmission within schools with simple and relatively cheap infection control strategies like masking, ventilation, and physical distancing, and considering that widespread vaccination coverage in most countries is not expected for many months, keeping schools closed until all staff can be vaccinated results in very little benefit in terms of reduced risk of transmission but potentially generates substantial costs for children.



On the other hand, anxiety among staff could interfere with their return to work and their effectiveness in the classroom. While the available evidence shows that COVID-19 transmission in schools can be managed even when adults are unvaccinated, vaccinating teachers will help protect them from community transmission. It can also reduce the risk of COVID-19-related absenteeism, resulting from teachers self-isolating if experiencing symptoms, and burnout among remaining teachers taking care of additional students. Governments may consider placing teachers and other school staff on a priority list for vaccination. As of July 2021, 53 percent of countries are prioritizing vaccinating teachers, according to the [Global Education Recovery Tracker](#). The average reflects large disparities across regions: in Sub-Saharan Africa, only 35 percent of countries consider teachers a priority group, compared to 50 percent in Latin America and the Caribbean and all countries in North America ([Johns Hopkins University, UNICEF and World Bank, 2021](#)). The disparities are a function of both priorities and vaccine access; countries with vaccine scarcity may be limiting prioritization of vaccines to health workers. To promote education recovery, teachers should be prioritized for vaccination where possible, while recognizing that there are ways to reopen safely without vaccination through adequate safety measures.

# The Risks to Children Associated with School Closures

When schools are closed, children learn less; some are not learning at all. Many education systems were unable to offer remote instruction that covered the equivalent to what children would have learned in school and that all students could access ([UNESCO, UNICEF, and World Bank 2020](#)). In fact, at least 463 million school children were unable to access remote learning during school closures in 2020 ([UNICEF 2020](#)). By March 2021, children across the world had lost an average of 74 days of school due to school closures and a lack of access to remote learning, which represents more than a third of a standard school year ([Save the Children 2021](#)). As demonstrated by UNESCO's [monitoring of school closures](#), lengthy closures have been a feature in much of Latin America and the Caribbean, Middle East and North Africa, as well as much of South Asia and parts of East Asia Pacific. As of late July 2020, many countries in East Asia Pacific were reaching [200 days of school closures](#). In Uganda, some schools were closed for approximately [300 days](#).



Even in countries able to quickly organize real-time online instruction, learning loss seems to be substantial. In Belgium, for example, where schools were closed or partially closed for one third of the school year in 2020, evidence from standardized tests implemented before and after the start of the pandemic suggests losses of 0.17 standard deviations for math and 0.19 standard deviations for language ([Maldonado and de Witte 2021](#)). Data from an 8-week school shutdown in the Netherlands show a learning loss of 0.08 standard deviations, which is equivalent to a fifth of a school year ([Engzell, Frey and Verhagen 2020](#)). Losses were 60 percent larger among students from less-educated homes, fueling concerns of the unequal impact of the pandemic, even in countries with high levels of equality and near universal broadband access. Similarly, an 8-week school shutdown in Switzerland showed that primary school students learned more than twice as fast when attending school in person compared to remote learning during school closures ([Tomasik, Helbling and Moser 2021](#)). Secondary school students fared better, and their learning pace was not significantly impacted by school closures.

A study from Sao Paulo in Brazil, where data was collected at the beginning and the end of 2020, shows that students learned 27.5 percent of what they would have learned if face-to-face classes had continued ([Lichand et al. 2021](#)). A sample of motivated children who maintained use of an online learning platform before and during the pandemic lost an equivalent of three and a half months of learning in math in Kenya ([Whizz Education 2021](#)). Evidence from past emergencies like the 2005 earthquake in Pakistan suggests that even if school enrollment recovers, the impacts of school closures and an aggregate shock on learning may last much longer ([Andrabi, Daniels, and Das 2020](#)).

In addition to instruction, schools promote children's well-being. In many countries, they provide children with nutritious meals and psychosocial support. Studies of children during the pandemic have documented high rates of anxiety and depression ([Bignardi et al. 2020](#); [Haripersad et al. 2020](#); [Lee 2020](#); [Luijten et al. 2020](#); [Xie et al. 2020](#)). A recent meta-analysis of 29 studies including over 80,000 youth shows that depression and anxiety have doubled globally, compared to pre-pandemic estimates ([Racine et al 2021](#)). Uncertainty about the pandemic, the loss of interactions with peers, disruptions to routines, and the stress associated with parents' employment at home or job loss may all contribute to these decreases in children's mental health. Increases in myopia (nearsightedness) have also been observed in some contexts ([Wang, Li, and Musch, 2021](#)). The increased stress, anxiety and depression parents and pregnant individuals have experienced during the pandemic, along with missed or reduced education, stimulation and play may have impacted child neurodevelopment. Emerging evidence from an ongoing longitudinal study in the United States show that compared to children born before the pandemic, children born during the pandemic have significantly reduced verbal, motor, and overall cognitive performance ([Deoni et al. 2021](#)).

# Useful Resources



## ***Research and Guidance on COVID-19***

- [Coronavirus Disease \(COVID-19\): Schools \(WHO Q&A\)](#)
- [COVID-19 School and Community Resource Library \(Massachusetts General Hospital\)](#)

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## ***Transmission in Schools***

- [What we know about COVID-19 transmission in schools \(in French\)](#)
- [COVID-19 in Children and the Role of School Settings in COVID-19 Transmission](#)
- [Operational Strategy for K-12 Schools through Phased Mitigation](#)



# References

- Andrabi, Tahir, Benjamin Daniels, and Jishnu Das. "Human Capital Accumulation and Disasters: Evidence from the Pakistan Earthquake of 2005." RISE Working Paper 20/039, Research on Improving Systems of Education, Washington, DC, May 2020. <https://riseprogramme.org/publications/human-capital-accumulation-and-disasters-evidence-pakistan-earthquake-2005>.
- Bignardi, Giacomo, Edwin S. Dalmaijer, Alexander L. Anwyll-Irvine, Tess A. Smith, Roma Siugzdaite, Stepheni Uh, and Duncan E. Astle. "Longitudinal Increases in Childhood Depression Symptoms during the COVID-19 Lockdown." *Archives of Disease in Childhood* December 9, 2020. <https://doi.org/10.1136/archdischild-2020-320372>.
- Bismarck-Osten, Clara von, Kirill Borusyak, and Uta Schönberg. "The Role of Schools in Transmission of the SARS-CoV-2 Virus: Quasi-Experimental Evidence from Germany." CReAM Discussion Paper Series. Centre for Research and Analysis of Migration (CReAM), Department of Economics, University College London, November 2020. <https://ideas.repec.org/p/crm/wpaper/2022.html>.
- Cull, Bill, and Mitch Harris. "Children and COVID-19: State-Level Data Report." American Academy of Pediatrics and Children's Hospital Association, Washington, DC, April, 2021. <https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/children-and-covid-19-state-level-data-report>.
- Deoni, Sean CL, Jennifer Beauchemin, Alexandra Volpe, Viren D'Sa, and the RESONANCE Consortium. "Impact of the COVID-19 Pandemic on Early Child Cognitive Development: Initial Findings in a Longitudinal Observational Study of Child Health." MedRxiv, August 11, 2021, <https://doi.org/10.1101/2021.08.10.21261846>.
- Engzell, Per, Arun Frey, and Mark D. Verhagen. "Learning Loss Due to School Closures During the COVID-19 Pandemic." Preprint. SocArXiv, October 29, 2020. <https://doi.org/10.31235/osf.io/ve4z7>.
- Goldstein, Edward, Marc Lipsitch, and Muge Cevik. "On the Effect of Age on the Transmission of SARS-CoV-2 in Households, Schools, and the Community." *The Journal of Infectious Diseases* 223, no. 3 (February 1, 2021) <https://doi.org/10.1093/infdis/jiaa691>.
- Gudbjartsson, Daniel F., Agnar Helgason, Hakon Jonsson, Olafur T. Magnusson, Pall Melsted, Gudmundur L. Norddahl, Jona Saemundsdottir, Asgeir Sigurdsson, Patrick Sulem, Arna B. Agustsdottir, Berglind Eiriksdottir, Run Fridriksdottir, Elisabet E. Gardarsdottir, et al., "Spread of SARS-Cov-2 in the Icelandic Population," *New England Journal of Medicine* 382, no. 24 (June 2020) <https://doi.org/10.1056/NEJMoa2006100>.
- Haripersad, Yasheer Venay, Madeleine Kannegiesser-Bailey, Katinka Morton, Sarah Skeldon, Nicolene Shipton, Kara Edwards, Rachel Newton, Amanda Newell, Paul Geoffrey Stevenson, and Andrew C. Martin. "Outbreak of Anorexia Nervosa Admissions during the COVID-19 Pandemic." *Archives of Disease in Childhood* 106 (July 24, 2020) <https://doi.org/10.1136/archdischild-2020-319868>.
- Harris, Douglas N., Engy Ziedan, and Susan Hassig. "The Effects of School Reopenings on COVID-19 Hospitalizations." National Center for Research on Education Access and Choice Technical Report, New Orleans, LA, January 4, 2021. <https://www.reachcentered.org/publications/the-effects-of-school-reopenings-on-covid-19-hospitalizations>.
- Ismail, Sharif A., Vanessa Saliba, Jamie Lopez Bernal, Mary E. Ramsay, and Shamez N, Ladhani. "SARS-CoV-2 Infection and Transmission in Educational Settings: A Prospective, Cross-Sectional Analysis of Infection Clusters and Outbreaks in England." *Lancet Infectious Diseases* 21, no. 3 (December 2021) [https://doi.org/10.1016/S1473-3099\(20\)30882-3](https://doi.org/10.1016/S1473-3099(20)30882-3).
- Johns Hopkins, UNICEF, and World Bank. "COVID-19 Vaccination for Teachers: Global Implications for Reopening Schools Equitably." Accessed August 12, 2021. <https://www.covideducationrecovery.global//stories/2021-07-09-vaccination-for-teachers/>.
- Laxminarayan, Ramanan, Brian Wahl, Shankar Reddy Dudala, K. Gopal, Chandra Mohan, S. Neelima, K. S. Jawahar Reddy, J. Radhakrishnan, and Joseph A. Lewnard. "Epidemiology and Transmission Dynamics of COVID-19 in Two Indian States." *Science* 370, no. 6517 (November 2020) <https://doi.org/10.1126/science.abd7672>.
- Lee, Joyce. "Mental Health Effects of School Closures during COVID-19." *The Lancet* 4, no. 6 (June 2020) [https://doi.org/10.1016/S2352-4642\(20\)30109-7](https://doi.org/10.1016/S2352-4642(20)30109-7).



- Leidman E, Duca LM, Omura JD, Proia K, Stephens JW, Sauber-Schatz EK. COVID-19 trends among persons aged 0-24 years—United States, March 1-December 12, 2020. *MMWR Morb Mortal Wkly Rep.* 2021;70(3):88-94. <https://www.cdc.gov/mmwr/volumes/70/wr/mm7003e1.htm>
- Lichand, Guilherme, et al. The Impacts of Remote Learning in Secondary Education: Evidence from Brazil during the Pandemic. SSRN Scholarly Paper, ID 3841775, Social Science Research Network, 21 May 2021. <https://papers.ssrn.com/abstract=3841775>.
- Luijten, Michiel A. J., Maud M. van Muilekom, Lorynn Teela, Hedy A. van Oers, Caroline B. Terwee, Josjan Zijlmans, Leonie Klaufus, Arne Popma, Kim J. Oostrom, Tinca J. C. Polderman, and Lotte Haverman. "The Impact of Lockdown during the COVID-19 Pandemic on Mental and Social Health of Children and Adolescents." Preprint, submitted November 4, 2020. <https://doi.org/10.1101/2020.11.02.20224667>.
- Macartney, Kristine, Helen E. Quinn, Alexis J. Pillsbury, Archana Koirala, Lucy Deng, Noni Winkler, Anthea L. Katelaris, Matthew V.N. O'Sullivan, Craig Dalton, Nicholas Wood, and the NSW COVID-19 Schools Study Team. "Transmission of SARS-CoV-2 in Australian educational settings: a prospective cohort study." *The Lancet: Child & Adolescent* 4 (August 3, 2020) [https://doi.org/10.1016/S2352-4642\(20\)30251-0](https://doi.org/10.1016/S2352-4642(20)30251-0)
- Maldonado, Joana Elisa, and Kristof De Witte. "The Effect of School Closures on Standardised Student Test Outcomes." *British Educational Research Journal*, July 21, 2021. <https://doi.org/10.1002/berj.3754>.
- Molteni, Erika, et al. "Illness Duration and Symptom Profile in Symptomatic UK School-Aged Children Tested for SARS-CoV-2." *The Lancet Child & Adolescent Health*, vol. 0, no. 0, Aug. 2021. [https://www.thelancet.com/journals/lanchi/article/PIIS2352-4642\(21\)00198-X/fulltext](https://www.thelancet.com/journals/lanchi/article/PIIS2352-4642(21)00198-X/fulltext).
- Public Health Agency of Sweden. "Covid-19 in Schoolchildren: A Comparison between Finland and Sweden." Article 20108-1, Public Health Agency of Sweden, Solna, Sweden, July 7, 2020. <https://www.folkhalsomyndigheten.se/publicerat-material/publikationsarkiv/c/covid-19-in-schoolchildren>.
- Racine, Nicole, Brae Anne McArthur, Jessica E. Cooke, Rachel Eirich, Jenney Zhu, and Sheri Madigan. "Global Prevalence of Depressive and Anxiety Symptoms in Children and Adolescents During COVID-19: A Meta-Analysis." *JAMA Pediatrics*, August 9, 2021. <https://doi.org/10.1001/jamapediatrics.2021.2482>.
- Save the Children. "Children Have Lost More than a Third of Their School Year to Covid-19 Pandemic - Save the Children," March 2, 2021. <https://savethechildren.org.au/media/media-releases/children-have-lost-more-than-a-third>.
- Smith et al. "Deaths in Children and Young People in England following SARS-CoV-2 infection during the first pandemic year: a national study using linked mandatory child death reporting data" Preprint, July 8, 2021. <https://doi.org/10.1101/2021.07.07.21259779>
- Schoeps, Anja, Dietmar Hoffmann, Claudia Tamm, Bianca Vollmer, Sabine Haag, Tina Kaffenberger, Kimberly Ferguson-Beiser, Berit Kohlhase-Griebel, Silke Basenach, Andrea Missal, Katja Höfling, Harald Michels, Anett Schall, et al. "COVID-19 Transmission in Educational Institutions August to December 2020, Rhineland-Palatinate, Germany: A Study of Index Cases and Close Contact Cohorts." Preprint, submitted February 20, 2021. <https://doi.org/10.1101/2021.02.04.21250670>.
- Schuster, Jennifer E., and Annabelle de St Maurice. "COVID-19 in Children—Not Just Little Adults." *JAMA Network Open* 4, no. 6 (June 7, 2021) <https://doi.org/10.1001/jamanetworkopen.2021.11441>.
- Tomasik, Martin J., et al. "Educational Gains of In-Person vs. Distance Learning in Primary and Secondary Schools: A Natural Experiment during the COVID-19 Pandemic School Closures in Switzerland." *International Journal of Psychology*, vol. 56, no. 4, 2021, pp. 566–76, <https://doi.org/10.1002/ijop.12728>.
- UNESCO, UNICEF, and World Bank. "What Have We Learnt?: Overview of Findings from a Survey of Ministries of Education on National Responses to COVID-19." UNESCO, UNICEF, and World Bank, Paris, New York, and Washington DC, October 2020. <https://openknowledge.worldbank.org/handle/10986/34700>.
- UNICEF. "COVID-19 and Children." UNICEF data hub, 2020. <https://data.unicef.org/covid-19-and-children/>.
- Viner, Russell M., Oliver T. Mytton, Chris Bonell, G. J. Melendez-Torres, Joseph Ward, Lee Hudson, Claire Waddington, et al. "Susceptibility to SARS-CoV-2 Infection Among Children and Adolescents Compared With Adults: A Systematic Review and Meta-Analysis." *JAMA Pediatrics* 175, no. 2 (February 1, 2021) <https://doi.org/10.1001/jamapediatrics.2020.4573>.

- Wang, Jiaying, Ying Li, and David C. Musch. "Progression of Myopia in School-Aged Children after COVID-19 Home Confinement." *JAMA Ophthalmology* 139, no. 3 (January 2021) <https://doi.org/10.1001/jamaophthalmol.2020.6239>.
- Whizz Education. MEASURING IMPACT OF COVID-19 ON LEARNING IN RURAL KENYA. Whizz Education, April 2021. <https://www.whizzeducation.com/wp-content/uploads/Kenya-Covid-Impact-SCREEN.pdf>.
- Xie, Xinyan, Qi Xue, Yu Zhou, Kaiheng Zhu, Qi Liu, Jiajia Zhang, and Ranran Song. "Mental Health Status among Children in Home Confinement during the Coronavirus Disease 2019 Outbreak in Hubei Province, China." *JAMA Pediatrics* 174, no. 9, (April 2020) <https://doi.org/10.1001/jamapediatrics.2020.1619>.
- Zhu, Yanshan, Conor J. Bloxham, Katina D. Hulme, Jane E. Sinclair, Zhen Wei Marcus Tong, Lauren E. Steele, Ellesandra C. Noye, et al. "A Meta-Analysis on the Role of Children in Severe Acute Respiratory Syndrome Coronavirus 2 in Household Transmission Clusters." *Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America* 72, no. 12 (June 15, 2021) <https://doi.org/10.1093/cid/ciaa1825>.