COVID-19 Transmission and Children: The Child Is Not to Blame

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Coronavirus disease (COVID-19) presents arguably the greatest public health crisis in living memory. One surprising aspect of this pandemic is that children appear to be infected by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes COVID-19, far less frequently than adults and, when infected, typically have mild symptoms,[1–3] although emerging reports of a novel Kawasaki disease–like multisystem inflammatory syndrome necessitate continued surveillance in pediatric patients.[4,5] However, a major question remains unanswered: to what extent are children responsible for SARS-CoV-2 transmission? Resolving this issue is central to making informed public health decisions, ranging from how to safely re-open schools, child care facilities, and summer camps down to the precautions needed to obtain a throat culture in an uncooperative child. To date, few published data are available to help guide these decisions.

In this issue of *Pediatrics*, Posfay-Barbe et al[6] report on the dynamics of COVID-19 within families of children with reverse-transcription polymerase chain reaction–confirmed SARS-CoV-2 infection in Geneva, Switzerland. From March 10 to April 10, 2020, all children <16 years of age diagnosed at Geneva University Hospital ($N = 40$) underwent contact tracing to identify infected household contacts (HHCs). Of 39 evaluable households, in only 3 (8%) was a child the suspected index case, with symptom onset preceding illness in adult HHCs. In all other households, the child developed symptoms after or concurrent with adult HHCs, suggesting that the child was not the source of infection and that children most frequently acquire COVID-19 from adults, rather than transmitting it to them.

These findings are consistent with other recently published HHC investigations in China. Of 68 children with confirmed COVID-19 admitted to Qingdao Women's and Children's Hospital from January 20 to February 27, 2020, and with complete epidemiological data, 65 (95.59%) patients were HHCs of previously infected adults.[7] Of 10 children hospitalized outside Wuhan, China, in only 1 was there possible child to adult transmission, based on symptom chronology.[8] Similarly, transmission of SARS-CoV-2 by children outside household settings seems uncommon, although information is limited. In an intriguing study from France, a 9-year-old boy with respiratory symptoms associated with picornavirus, influenza A, and SARS-CoV-2 coinfection was found to have exposed over 80 classmates at 3 schools; no secondary contacts became infected, despite numerous influenza infections within the schools, suggesting an environment conducive to respiratory virus transmission.[9] In New South Wales, Australia, 9 students and 9 staff infected with SARS-CoV-2 across 15 schools had close contact with a total of 735 students and 128 staff.[10] Only 2 secondary infections were identified, none in adult staff; 1 student in primary school was potentially infected by a staff member, and 1 student in high

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school was potentially infected via exposure to 2 infected schoolmates.

On the basis of these data, SARS-CoV-2 transmission in schools may be less important in community transmission than initially feared. This would be another manner by which SARS-CoV-2 differs drastically from influenza, for which school-based transmission is well recognized as a significant driver of epidemic disease and forms the basis for most evidence regarding school closures as public health strategy.[11,12] Although 2 reports are far from definitive, the researchers provide early reassurance that school-based transmission could be a manageable problem, and school closures may not have to be a foregone conclusion, particularly for elementary school–aged children who appear to be at the lowest risk of infection. Additional support comes from mathematical models, which find that school closures alone may be insufficient to halt epidemic spread[13] and have modest overall impacts compared with broader, community-wide physical distancing measures.[14]

These data all suggest that children are not significant drivers of the COVID-19 pandemic. It is unclear why documented SARS-CoV-2 transmission from children to other children or adults is so infrequent. In 47 COVID-19–infected German children, nasopharyngeal SARS-CoV-2 viral loads were similar to those in other age groups, raising concern that children could be as infectious as adults.[15] Because SARS-CoV-2 infected children are so frequently mildly symptomatic, they may have weaker and less frequent cough, releasing fewer infectious particles into the surrounding environment. Another possibility is that because school closures occurred in most locations along with or before widespread physical distancing orders, most close contacts became limited to households, reducing opportunities for children to become infected in the community and present as index cases.

Almost 6 months into the pandemic, accumulating evidence and collective experience argue that children, particularly school-aged children, are far less important drivers of SARS-CoV-2 transmission than adults. Therefore, serious consideration should be paid toward strategies that allow schools to remain open, even during periods of COVID-19 spread. In doing so, we could minimize the potentially profound adverse social, developmental, and health costs that our children will continue to suffer until an effective treatment or vaccine can be developed and distributed or, failing that, until we reach herd immunity.[16,17]

ABBREVIATIONS

COVID-19: coronavirus disease
HHC: household contact
SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

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