

## **Technical Note on Pediatric COVID-19: A call for improved country surveillance and health information systems**

Emma Sacks, Tedbabe Degefie Hailegebriel, Jennifer Requejo

On 20 September, 2023 the UN High-Level Meeting on Pandemic Prevention, Preparedness and Response will be held with the intended outcome of a declaration aimed at mobilizing political will at the national, regional, and international levels (<https://www.who.int/activities/preparing-for-the-un-high-level-meeting-on-pandemic-prevention--preparedness-and-response--2023>). This technical note puts forward a call for investments in strong country surveillance and health information systems that are inclusive of all population groups, including children. Such investments will ensure that responses to future pandemics and outbreaks are evidence driven, equitable, and responsive to the needs of the most vulnerable.

### *Including children in research efforts: Lessons learned from COVID-19*

When SARS-CoV-2 and its associated disease, COVID-19, was declared a global pandemic in March of 2020, it eclipsed attention to all other health issues and caused major disruptions to health systems, economies, and communities. Most COVID-19 related research and reporting has concentrated on adult and elderly populations because of evidence indicating higher transmission, morbidity, and mortality among older population groups. However, this focus on older populations has resulted in gaps in knowledge on the effects of COVID-19 on the pediatric population. Children and adolescents account for about 20% of infections<sup>1,2</sup> and about 0.4% of all COVID-19 deaths<sup>3</sup>. Given evidence on the potential for lingering adverse health outcomes from infection<sup>4</sup> as well as a need to understand the short-, medium- and long-term effectiveness of COVID-19 vaccinations, children should be included in COVID-19 research efforts moving forward.

We conducted a systematic review of studies on pediatric COVID-19 transmission and disease progression published in the first year of the pandemic (Box 1). Our findings showed that most research came from higher income countries, and from non-generalizable case reports and case series. Age categories used in the studies were often inconsistent, hampering the establishment of a clinical picture of the direct effects of COVID-19 on children and adolescents. This paper presents the main findings from our review and their implications for strengthening country surveillance and health information systems, so children and adolescents are no longer overlooked in responses to COVID-19 and to future disease outbreaks and pandemics. The main findings are organized as “lessons learned”.

#### Box 1. Methods for systematic review

We undertook a rigorous systematic review on the direct effects of SARS-CoV-2 on pregnant women, newborns, infants, and children. Our review focused specifically on transmission risk in utero and

from mother-to-child during delivery and breastfeeding, and among pediatric and adolescent populations. We reviewed published literature from 1 November 2019 – 31 December 2020. Using Medline as the primary database, we identified and screened 7,940 titles and abstracts for relevance, extracted pertinent information on the 162 eligible studies and their findings, assessed the quality of studies, and categorized them based on their objectives, sample sizes, and outcomes<sup>5</sup>.

*Lesson 1. COVID-19 research has disproportionately focused on higher income countries, resulting in a biased understanding of the pandemic on children around the world*

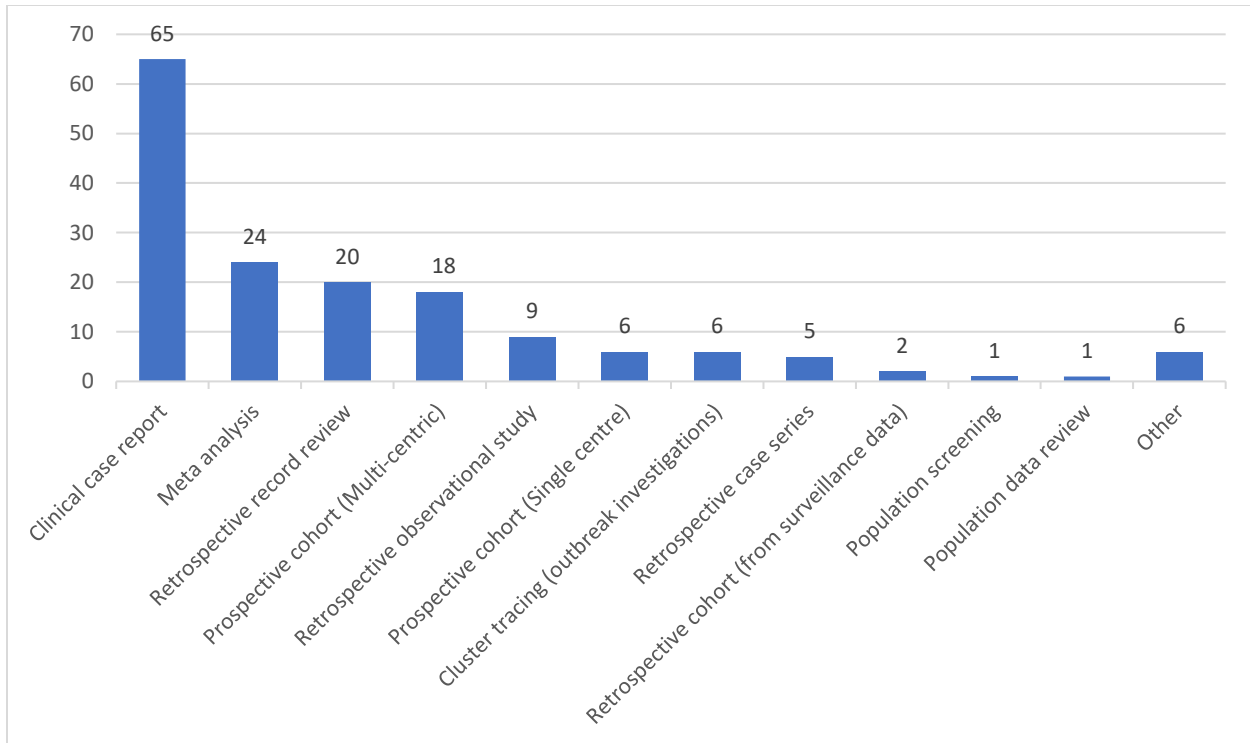
Early in the pandemic, most COVID-19 cases and deaths were reported from high-income countries and China for several reasons including the higher disease burden in these settings<sup>6</sup>. High-income countries also have stronger surveillance systems and greater levels of funding available for research and crisis response than lower-income contexts<sup>7</sup>.

The pandemic was first detected in China and shortly after in Western Europe and the US. Countries with younger population structures including many low-and middle-income countries (LMICs) may have experienced lower mortality and severe morbidity from the virus in the early waves, and, hence, cases may have gone undetected<sup>8</sup>. The true number of cases and deaths in LMICs may also have been underreported due to limited resources available for testing, research, and surveillance<sup>9</sup>. Our systematic review on the pediatric population results substantiates a geographic bias in scientific reporting in the first year of the pandemic. Almost 40% of the included studies focus on China, 58% on high income countries, and only nine papers relate to LMICs other than China (namely Bangladesh, Brazil, Kenya, India, Peru, Thailand, and Venezuela). We found no studies from South Africa despite its high disease prevalence and exposure to multiple mutations and variants.

*Lesson 2. Much of the early research on children came from case studies and case series collected at health facilities, limiting the generalizability of the findings*

Over half of the included studies were case reports and clinical case reviews, generally from one health facility, presenting a snapshot of a single pediatric patient or maternal-newborn dyad. Although case series are a key source of information when a new medical issue arises, few population-based or surveillance studies included pediatric populations even many months into the pandemic.

**Figure 2. Types of studies represented in studies included in systematic review of perinatal and pediatric SARS-CoV-2 transmission through Dec 2020 (n=162)**



***Lesson 3. Lack of reporting on standardized age categories hampered efforts to synthesize evidence and develop policy recommendations***

Consistent with other reports<sup>1</sup>, our review found wide variation in the age categories used across studies, limiting the ability to draw conclusions about the impact of COVID-19 on children. In their research combining 32 studies on acute SARS-CoV-2 infection in children and adolescents, for example, Viner et al. were unable to conduct a meta-analysis due to massive heterogeneity in the age groups used<sup>10</sup>. Country alignment to WHO proposed recommendations on standard age categories for health reporting would vastly improve the ability to pool and analyze data on children and adolescents, and to develop evidence-based child health programmes and policies during pandemic and non-pandemic periods<sup>11</sup>.

***Lesson 4. Lack of rigorous data on school settings created challenges for developing policies on school closures and re-openings***

A limited number of studies in our review reported on schools (n=10), daycare centres (n=3), and overnight camps (n=2). This paucity of studies could be due to widespread facility closures and because schools, daycare centres, and camps are generally not set up to routinely collect health data. Although the findings from these studies and research conducted after our review<sup>12,13</sup> suggest child-child transmission in school settings is low, the evidence was insufficient to guide decision making around school closures in the early waves of the pandemic. Systematic documentation on COVID-19 protocols implemented in schools and corresponding transmission rates would have equipped governments and school administrators with timely evidence to appropriately adjust school policies as the pandemic evolved.

*Lesson 5. Persistent knowledge gaps should be addressed by developing inclusive research agendas and investments in health information systems*

Over two years after the start of the pandemic, new variants continue to emerge. Variants such as B.117 (Alpha), B.1.351 (Beta), B.1.617.2 (Delta), and B.1.1.529 (Omicron) raise concerns that the virus may, over time, increase in lethality and transmissibility and reduce the effectiveness of available vaccines and treatments. Waning adherence to prevention measures and the opening-up of economies and schools are impacting viral spread. Research efforts and data collection on the virus should keep pace with these changes and include the pediatric population.

Remaining knowledge gaps on the impact of COVID-19 on child and adolescent health indicate that greater investments in research are needed so that children are not left behind. Better pediatric data using standard age categories on cases, deaths, and disease progression are essential for guiding clinical practice as well as child health policies and programs. There is evidence that COVID-19 infections (even when the initial infection was clinically mild) can have long-term health effects. Cohorts representing children from around the world should be established to understand the short-and long-term health effects of COVID-19 on the pediatric population including different sub-populations (e.g., children and adolescents with co-morbidities, disadvantaged population groups). Without adequate population-based longitudinal studies that include children from diverse backgrounds, we will not be able to provide children with the treatment, care, and support they may need.

Scoping and living systematic reviews that include the pediatric population should be properly resourced to enable rapid synthesis of new evidence that can inform practitioners, communities, governments, and global partners, and improve preparedness for future pandemics. Children under the age of 12 should also continue to be safely included in vaccine trials<sup>14 15</sup>, and included in post-market surveillance, adverse event registries, and testing programs so that treatment effectiveness, immunity, and other impacts can be monitored, in various settings.

In addition to investments in research, greater resources are urgently needed to strengthen surveillance and health information systems in LMICs. Specific actions include supporting digitalization of data entry to facilitate age-specific data aggregation, improving the integration of community-based data into routine health information systems, and investments in human and technological capacity to maintain data systems. Investments are also needed to build country capacity to analyze and use surveillance and other forms of data for policy and programmatic decisions. Strong country surveillance and health information systems will enable individual LMICs to generate the robust data they need to track and effectively respond to COVID-19 and all other health emergencies impacting their populations, including children and adolescents.

COVID-19 has provided further proof that diseases do not respect country borders and that controlling and responding to disease outbreaks requires global coordination. Improved global data governance mechanisms will foster greater data sharing across countries and joint efforts to prepare for and combat new waves of COVID-19 as well as future pandemics. Recent developments such as the establishment of the WHO Hub for Pandemic and Epidemic Intelligence<sup>16</sup> and other multi-country research collaborations<sup>17</sup> are promising steps in this direction of increased global coordination and cooperation. Such steps are key for securing a healthy future for our children.

**Authors**

Emma Sacks worked on this manuscript as part of a consultancy with UNICEF. Tedbabe Degefi Hailegebriel and Jennifer Harris Requejo were both staff at UNICEF headquarters, New York, NY at the time of the development of this manuscript. Jennifer Harris Requejo is a long standing member of the Countdown to 2030 initiative and is currently supporting the Countdown to 2030 and Global Financing Facility for Women's, Children's, and Adolescents' Health partnership.

## Acknowledgements

We acknowledge USAID for funding of this work. The authors thank Mark Hereward, Luwei Pearson, Pavani Ram, Bill Weiss, Lale Say, Danzhen You, Jenny Creswell, Priscilla Idele, Lynne Mofenson, Kate Strong, Theresa Diaz, Marzia Lazzerini, Joanna Schellenberg, Ralf Weigel, and Sayaka Horiuchi for input at various stages of the review and analysis. We also acknowledge PMNCH colleague Ilze Kalnina for her review and inputs to the technical note.

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