

Updated [6/28/21] [10/17/21]

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Peer Review by: [Jason Rosenfeld]

Key topic areas / questions identified:

How susceptible are pediatric populations to COVID-19? Which subpopulations are more susceptible?

Key Findings:

- COVID-19 teenage hospitalization rates from COVID-NET peaked at 2.1 per 100,000 in early January 2021, then dropped to 0.6 by mid-March before rising to 1.3 in April. Nearly one-third of hospitalized adolescents required intensive care unit admission, and 5% required invasive mechanical ventilation; no deaths were reported.²⁷
- With considerable infection mitigation efforts, exposure to childcare during the beginning of the pandemic had no correlation to increased COVID-19 transmission rate to providers. US childcare providers (57,335 participants) reported if they had ever tested positive for COVID-19 or hospitalized for COVID-19 (427 cases), as well as their exposure to child care. No association was detected between exposure to childcare in both unmatched and matched analysis (where background transmission rates were controlled statistically).²⁴
- In North Carolina, 11 school districts tracked the COVID-19 reports in their schools after re-opening from August 15 – October 23. 773 out of over 90,000 students and staff tested positive during that time and there was no child to adult transmission reported. Students and staff were required to wear masks or face shields when masks were not possible.²³
- From August 2020 to December 2020, most kindergarten through grade 12 public and private schools in Florida reopened for in-person classes. COVID-19 cases were tracked. Incidence was highest in smaller counties, districts without mask requirements, and those that reopened earliest after closure in March 2020.²²
- From August 2020, a school district in Salt Lake County, Utah, reopened schools. During December 2020 to January 2021, a convenience size of 20 elementary schools in Salt Lake County, Utah, was sampled for SARS-CoV-2 transmission. 70.6% were tested and five of 12 positive cases were classified as school-associated; the secondary attack rate was 0.7%.²⁷
- From March 1, 2020 – March 7, 2021, there were 21,893,154 confirmed cases of COVID-19 in people 0-24 years old. People 0-4 years old made up 2% of cases and 5-17 made up 9.5%.²¹
 - In Jan 2021, an epidemiologic systematic review reporting the largest number of children less than 5 years of age with COVID-19 infection found half of young cases were asymptomatic and half were infants (<1 year old).²⁵
- States use different definitions of children for COVID-19 data collection. Age ranges vary state to state from 0-14 (2 states) to 0-24 (Alabama before they switched to 0-17 in August). Most states define children as 0-17 (14 states) or 0-19 (29 states and DC).¹⁸
- Children make up about 10% of confirmed US cases so far, though this may be due to undertesting of asymptomatic or mild cases.^{1,2,3} Children are more likely than adults to have mild or asymptomatic disease.⁴
 - A case series of 91 children (0-18 years old) with COVID-19 in Korea found that only 8.5% of symptomatic cases were diagnosed at the time of symptom onset, suggesting that symptoms screening fails to identify most COVID-19 cases in children.⁵

Commented [RJ1]: A few more sources to consider...

<https://jamanetwork.com/journals/jama/fullarticle/2769036> (Reopening K-12 schools during covid-19 pandemic)

Zheng et al. (Aug 5, 2020). An Increasing Public Health Burden Arising from Children Infected with SARS-CoV2: A Systematic Review and Meta-Analysis. *Pediatric Pulmonology*. <https://doi.org/10.1002/ppul.25008>

Goyal et al. (Aug 1, 2020). Racial/Ethnic and Socioeconomic Disparities of SARS-CoV-2 Infection Among Children. *Pediatrics*. <https://doi.org/10.1542/peds.2020-009951>

Macartney et al. (Aug 2020). Transmission of SARS-CoV-2 in Australian Educational Settings: A Prospective Cohort Study. *The Lancet Child & Adolescent Health*. [https://doi.org/10.1016/S2352-4642\(20\)30251-0](https://doi.org/10.1016/S2352-4642(20)30251-0)

Commented [RJ2]: how are children defined? Age range.

Commented [RJ3]: I still think it is worth defining children. What is the age range that is being reported?

Commented [JA4R3]: So for the national data it's hard to report an age range because all the different states use different ranges. Alabama even changed its range partway through collection. Should I take space to explain that?

Commented [RJ5R3]: Sorry this took me so long to reply. yeah, this is frustrating. We can either leave this definition up here...or you can insert the specific definition for each study/citation.

- The number and rate of cases in children are increasing.³ In the 8 weeks prior to September 10, children represented 12-15% of weekly reported cases in the US.¹
- From March to September in the US, COVID-19 incidence among children 12-17 was about twice that of children aged 5-11.⁶
- While most cases in children are mild, severe illness requiring hospitalization and mortality do occur. 1 in 3 children who are hospitalized are admitted to the ICU.⁷
 - From March 1 to May 7, 2020, the severity of acute appendicitis in 3 pediatric hospitals in New York (was once the epicenter of the pandemic) was markedly higher than prior to the pandemic. Preoperative detection of COVID-19 infection was not associated with poor outcomes. Thus, disruption to seeking local health care due to the pandemic might negatively interfere and worsen other aspects of pediatric surgical care.²⁶
 - Children with low household incomes, as well as Black and Hispanic children have disproportionately high rates of infection compared to white children. The disproportionately high rates of infection in Black and Hispanic children persisted even when adjusted for comorbidities, socioeconomic, and sociodemographics.⁸
 - Hispanic children are 8 times more likely, and Black children are 5 times more likely than white children to be hospitalized for COVID-19.⁷
 - Children with pre-existing co-morbidities and infants may be at higher risk for severe illness.^{2,9,10} Since Black and Hispanic children have higher prevalence of pre-existing conditions, this may be part of the reason for the disparity in hospitalizations.⁷
- There is conflicting evidence on whether children transmit COVID less than adults, perhaps in part due to a lower case count.¹¹
 - Early household transmission studies suggest children are rarely the index case, and that children may be less likely to cause outbreaks than adults.^{10,12} However, more recent studies suggest children can spread the virus effectively in households and camp settings.³
 - Early studies suggested children may have lower viral loads than adults, making them less likely to transmit.^{10,12} However, more recent data suggest children may have the same or higher viral loads as adults.³ Children's milder symptoms may lead to fewer respiratory droplets.^{10,12}
 - Reports from schools in Israel have shown outbreaks in schools within the first few weeks of reopening.¹³
 - Some Australian schools have reported relatively low rates of transmission, though these were in areas where the pandemic was relatively well-controlled.¹⁴ Similarly, schools in Rhode Island that employed strict distancing, masking, disinfection, and symptom screening had few cases after reopening.²⁰
 - A large contact-tracing study in India found no difference in infection risk between contacts of adults and contacts of children infected with COVID-19.¹⁵
 - A large population-based cohort study in England found that working age adults living with children ages 0-18 were not at increased risk of serious COVID outcomes, but that living with children 12-18 years was associated with a small (3-13%) increased risk of infection.¹⁹
 - There is some evidence that older children (10-18) have a higher secondary attack rate compared to younger children (under 10).²⁰
- Multi-system Inflammatory Syndrome in children (MIS-C) is a rare but serious syndrome associated with COVID-19.¹⁶ The majority of children with MIS-C were previously healthy.¹⁷

Commented [R]6: Godfred-Cato et al. (Aug 7, 2020). COVID-19–Associated Multisystem Inflammatory Syndrome in Children — United States, March–July 2020. MMWR. <https://doi.org/10.15585/mmwr.mm6932e2>

- A relatively high proportion of children with MIS-C are Black or Hispanic.^{16,17} The percentage of children with MIS-C who are Black or Hispanic was similar to the reported percentage of children who are Black or Hispanic who have COVID-19, which is disproportionately high.¹⁷
- In a study in prefecture in Japan, a study was conducted to discern the effect individual isolation and physical distancing had on pediatric outcomes.²⁸
 - The number of hospitalizations for infectious diseases like influenza (-74.8 percent) and respiratory syncytial virus infection (-93.5 percent) declined significantly.
 - The number of clinical psychiatric interventions and cases reported to the child guidance center, on the other hand, increased. Individual infection control measures and physical separation are necessary in the setting of pandemic infectious diseases to reduce the spread of dangerous infectious diseases. However, for children's mental health and physical growth, it is critical to maintain social life as much as possible.
- A study found that in seven of the eight states whose data was evaluated, reopening of schools resulted in an initial 5-day increase in COVID-19 infections. With schools reopening across the country in the fall of 2021, the Delta variety is projected to see a major increase in infections.²⁹

Commented [JA7]: I recognize that this is somewhat odd wording, but I wanted to make sure I wasn't mistating what the paper actually said. I *think* the article is saying that the percentage of kids who are black/Hispanic who get MIS-C is higher, but in proportion to their higher risk of getting infected overall (IE, NOT because the rate of black kids who are infected who then get MIS-C is higher). Could you provide some guidance on whether 1) my reading of the paper is accurate and 2) how to word this?

Recommendations:

- Close contact sports in which mask wearing is not feasible should be postponed as transmission in these groups can lead to an increase in cases among students at the school and the community overall.²²
- Clinicians should monitor for progression of illness in children, especially in infants and children with pre-existing conditions, as well as for MIS-C.^{7,16}
- Public health efforts should ensure equitable allocation of testing and culturally appropriate prevention education.¹⁸ More research is needed to determine the modifiable reasons for disparities in COVID infection rates and hospitalizations in order to find effective preventative measures.
- Preventive measures (e.g., social distancing, respiratory hygiene, and wearing face coverings in public settings where social distancing measures are difficult to maintain) should be continued to prevent transmission by children and adults with asymptomatic or mild disease.^{7,22}
- Schools will need to have adequate preventive measures (distancing, sanitization, and air ventilation and filtration) to reopen safely.^{10,11,12,18,20,22}
 - It is possible to re-open schools with minimal transmission if safety guidelines are in place.²³
- Clinicians should have a lower threshold for psychiatric assessment for pediatric populations due to the socially isolating and debilitating effects of isolation.²⁸

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