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Usher Network for COVID-19 Evidence Reviews

# Summary: What is the evidence for transmission of COVID-19 by children [or in schools]?

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THE UNIVERSITY of EDINBURGH | usher institute

## Title: What is the evidence for transmission of COVID-19 by children [or in schools]?

## Summary answer:

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| Despite librarian-supported duplicate searches by experienced reviewers, no high quality studies directly addressing the study question were identified. There is very limited evidence of transmission of SARS-COV-2 from children (based on a case report where there was COVID-19 confirmed transmission from one child to family members in China (Key reference [KR1]) and two pupils infecting another pupil after close contact in a high school in Australia [KR2]). |
| It is estimated that the number of infected children with latent asymptomatic or with mild symptoms of respiratory or gastrointestinal illness is higher than in adults and some studies highlight that young people and children may be important sources of asymptomatic transmission. An investigation on environmental contamination in the isolation room of an infected infant confirmed that a generally well infant with COVID-19 can contaminate the environment with PCR-detectable virus [KR3]. In addition, there is risk of transmission by infected children (with virus in nasal secretions and stools). At least 3 studies have shown that children show a longer faecal shedding time (and in some studies longer than adults (and in some cases that was longer than 4 weeks) [KR4-6]. A study of 3,712 COVID-19 patients analysed the variance of viral loads in patients of different age categories and found no significant difference between age categories and concluded that children may be as infectious as adults [KR7]. |
| It is widely reported that children can get infected after exposure to confirmed cases, through household or travel contacts. Perinatal infection can also occur when the baby is born to a pregnant woman with confirmed infection via vaginal delivery, while vertical transmission from mother to infant or via breastfeeding have not yet been established. An outbreak around a French school was reported, where they found that 40% of pupils and staff became infected with no difference between the two groups [KR8]. Almost all the students in the study were aged 15-17 years of age, who appear to have similar disease characteristics to adults. A report from New South Wales, from March to mid-April 2020, identified 18 individuals (9 pupils and 9 staff) from 15 schools that were confirmed COVID-19 cases. A total of 735 pupils and 128 staff were close contacts of these initial 18 cases. No teacher or staff member contracted COVID-19 from any of the initial school cases. One child from a primary school and one child from a high school may have contracted COVID-19 from the initial cases at their schools [KR2]. |
| Targeted (n=9,199) and random population screening (n=13,607) from Iceland found that children under 10 years of age were less likely to receive a positive result than were persons 10 years of age or older (6.7% vs 13.7% for targeted testing; and 0% vs. 0.8% for random population testing) [KR9]. The Italian principality of Vo tested >85% of their population following their first death from COVID-19, and found no positive cases in children despite 2.6% of the population being positive [KR10]. A demographic breakdown of the first 7,755 laboratory confirmed cases in South Korea (where more extensive community testing has been implemented) showed that only 1% of the confirmed cases were <10 years old and 5.2% were 10-19 years old [KR11]. A study in the Netherlands is undertaking community serology testing for antibodies against SARS-CoV-2 and in their first release of preliminary results they have found 4.2% of adults are positive compared to 2% of those aged <20 years [KR12]. Finally, a COVID-19 Antibody Seroprevalence Study in Santa Clara County, California showed that positivity of the antibody test was not different across different age groups (but children were from the same household of the adults that were selected for testing) [KR13]. |
| Available evidence suggests that children may have more upper respiratory tract (including nasopharyngeal carriage) than lower respiratory tract involvement. An ISARIC WHO study of 16,749 hospitalised UK patients with COVID-19 from 166 UK hospitals found that only 2% of the patients were under 18 years old (n=239 patients) and only 1.1% were under 5 years old (n=139 patients) [KR14]. A nationwide case-series of 2135 paediatric patients with COVID-19 reported to the Chinese Centre for Disease Control and Prevention found that more than 90% of all patients had asymptomatic, mild, or moderate symptoms. The proportions of severe and critical cases was highest in the age group <1 years old (10.6%) followed by the 1-5 years old category (7.3%) [KR15]. However, a new paediatric multisystem inflammatory syndrome has been identified and temporally associated with COVID-19. A small number of children that developed a significant systemic |

inflammatory response have recently been identified in the UK, the US, France, Italy, Spain and Switzerland. This has triggered the release of a new guidance from the Royal College of Paediatrics and Child Health [KR16]. Research on this topic is currently on going (DIAMONDS, ISARIC) and a new study from the British Paediatric Surveillance Unit will be launching soon.



## Extended abstract:

We run searches in PubMed, medRxiv and WHO COVID-19 database to identify relevant studies reporting on the COVID-19 transmission routes among infected (both symptomatic and asymptomatic) children and adolescences. This update covers the period **up to 4 May 2020**. The literature screening was shared between four reviewers (XL, WX, YH, AK). Each new title, abstract and full text was screened by one reviewer. A total of 993 publications were retrieved (130 unique from the original search; 201 unique from the first update and 662 from the second update). A total of 80 unique studies were included: 2 studies (1, 64) investigating SARS-COV-2 transmission from diagnosed children; 6 studies presenting direct or indirect evidence on the potential of COVID transmission by children (2, 65-69); 73 studies (3-64, 70-81) exploring the transmission routes of how children were infected including 2 studies/ reports exploring school outbreaks (64, 81). We found 32 reviews (89-120) exploring the transmission of COVID-19 infection among children and 1 policy brief from the Swiss National Science Task Force (82). References of previous reviews and briefs were searched by four reviewers (YH, WX, XL, ET). We also found five studies (83-87), that addressed a relevant research question (i.e proportion of children infected identified through random or targeted population testing) and we also report results from a large hospital based study from the UK (88) and a nation-wide case-series from China (121). We have included these studies, but we plan to expand the scope of our review to systematically search for this and other relevant research questions (including studies on attack rate of the disease in children and modelling studies on the effect of school closures).

All the references are presented in a separate file. Please see below the references of the evidence highlighted in the summary answer.

***Conclusions:*** **There is very limited evidence of paediatric cases as a source of infection, which highlights the importance of obtaining robust data on this. Preliminary results from large targeted, population and school studies show that children (especially younger children) are less likely to be infected or infect others, but other studies show a similar viral load in children as in adults. Also, faecal-oral transmission appears to be risk of transmission by infected children, given the observed faecal shedding time, which may have substantial implications for community spread in day-care centres, schools, and homes.**

## Link to full review and any relevant updates: https://edin.ac/children

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## Contact details of lead reviewers: Prof Evropi Theodoratou (e.theodoratou@ed.ac.uk); Marshall Dozier; Dr Xue Li; Wei Xu; Yazhou He; Dr Amir Kirolos.

The UNCOVER network is committed to responding quickly and impartially to requests from policymakers for evidence reviews. This document has therefore been produced in a short timescale and has not been externally peer-reviewed.

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