Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Archives de Pédiatrie 27 (2020) 388–392

Available online at ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com/en

Practice guidelines

COVID-19 and schools. Guidelines of the French Pediatric Society☆

R. Cohen [a], C. Delacourt [b,*], C. Gras-Le Guen [c], E. Launay [c] for the French Pediatric Society[1]

[a] Centre hospitalier intercommunal de Créteil, 94000 Créteil, France
[b] AP–HP, hôpital universitaire Necker-Enfants–Malades, 75015 Paris, France
[c] Service de pédiatrie générale, hôpital Mère–Enfant, CHU Nantes, 44000 Nantes, France

ARTICLE INFO

Article history:
Available online 4 September 2020

Keywords:
COVID-19
SARS-CoV-2
School
Infection
Virus
Outbreak

ABSTRACT

The educational and social benefits provided by school far outweigh the risks of a possible COVID-19 contamination of children in school environments or in daycare centers. Following summer break, the back-to-school period in France is taking place in the context of an increasing viral spread and requires strict adherence to health measures to limit the risk of outbreaks in communities. Based on a critical update of the role of children in the transmission of the infection, and of children's susceptibility to infection, the French Pediatric Society published practical guidelines for school re-entry and the management of COVID-19 infections in schools.

1. Introduction

In France, the COVID-19 epidemic was accompanied by a lockdown involving the total closure of schools on March 13, 2020. Schools reopened very gradually from May 11, 2020 until the summer break. The French Pediatric Society (SFP) and various societies of pediatric specialties have firmly supported the return of children to school, including those with chronic illnesses [1]. The back-to-school period, set for September 2, 2020, is taking place in the context of an increase in viral spread and requires strict adherence to health measures to limit the risk of outbreaks in communities. It is crucial to recall that the educational and social benefits provided by school far outweigh the risks of a possible COVID-19 contamination of children in school environments or in daycare centers (DCC). In line with the position taken by pediatric authorities in many countries, the SFP proposes a practical management of COVID-19 infections in schools, compatible with regular in-person teaching and without imposing on children repeated screening tests, which is of no benefit for epidemic control (Appendix 1).

2. Methods

These guidelines are based on an exhaustive search of studies concerning the role of children in the transmissibility of the infection and of children's susceptibility to infection. The PubMed and medRxiv databases were searched, with a particular focus on publications from the past 3 months. The following keywords were used: children, pediatric, COVID-19, SARS-CoV-2, schools, transmission, susceptibility, outbreak, household. This review of recent publications was organized around four themes: (a) the role of children in transmission, (b) susceptibility to infection, (c) expression of the disease in children, and (d) the benefits of school. The established recommendations were also compared with the different positions taken by pediatric societies or governmental health organizations in Europe.

☆ The French version of the French Pediatric Society's proposals is available on: https://www.sfpediatrie.com/sites/www.sfpediatrie.com/files/medias/documents/propositions_ecoles_sfp_def.pdf.

* Corresponding author. Service de pneumologie et allergologie pédiatrique, hôpital Necker-Enfants–Malades, 149-161, rue de Sèvres, 75015 Paris, France.
E-mail address: christophe.delacourt@aphp.fr (C. Delacourt).

[1] C. Delacourt and C. Gras-Le Guen are President and General Secretary of the French Pediatric Society (SFP), respectively. R. Cohen is President of the French Group of Pediatric Infectious Disease, belonging to the SFP. E Launay is President of the French Group of General and Social Pediatrics, belonging to the SFP.

https://doi.org/10.1016/j.arcped.2020.09.001

3. Role of children in the transmission of SARS-CoV-2: critical update

3.1. Children, and especially those under 10 years of age, do not contribute significantly to the dynamics of the SARS-CoV-2 epidemic: The secondary attack rate from children is very low, and clusters initiated by a pediatric case are rare

There are now many observational studies from several countries, models, or meta-analyses that allow us to assert the low transmitter status of children compared with adults. In Irish schools, no secondary cases were found among the 1,001 children who came into contact with three pediatric cases (10–15-year-old children) and three adult cases [2]. In England, national surveillance following the reopening of educational settings in June and July 2020 showed that only 70 children were affected out of more than 1 million children attending preschool and primary school [3]. Only 0.01% of open educational settings had an outbreak. Importantly, staff members had an increased risk of SARS-CoV-2 infections compared with students in any educational setting, and the majority of cases linked to outbreaks were in staff [3]. In Guangzhou (China), a retrospective study of 195 intrafamily clusters showed that the lowest risk of infection was in contacts under 20 years of age (OR = 0.23 [0.11–0.46]) compared with contacts over 60 years of age. Transmission was highest during the incubation period [4]. In Switzerland, the evaluation of 111 intrafamily contacts around 40 cases of infected children under 16 years of age showed that a pediatric case was suspected to be the first intrafamily case in only 8% of cases [5]. In Australia, testing of contacts linked to 12 children and 15 adults in 15 schools (children aged 6 years and older) and 10 kindergartens/nurseries (children aged 6 weeks to 5 years) showed a child-to-child attack rate of 0.3%, a child-to-adult attack rate of 1%, an adult-to-child attack rate of 1.5%, and an adult-to-adult attack rate of 4.4%. Only one daycare center experienced an outbreak with six adults and seven children infected out of 35 contact cases; transmissions were adult-to-adult and adult-to-child [6]. In France, 80 schoolchildren were tested in three classes attended by a 9-year-old infected boy. No secondary cases were observed [7]. In Korea, the reports for contacts of 5706 index cases were analyzed. Children between 0 and 9 years of age represented only 29 index cases (0.5%) and those between 10 and 19 years of age only 124 index cases (2.2%). The number of infected people was much higher in the home than outside the home (11.8% vs. 1.9%, respectively). The rate of cases linked to the index case was the lowest among children aged 0–9 years (5.3% at home vs. 1.1% outside the home). This rate was high among adolescents aged 10–19 years (18.6% at home vs. 0.9% outside the home). However, it was not known whether the index case, defined as the first identified case, was actually the transmitter [8]. In Rhode Island, strict surveillance was implemented after the reopening of 666 communities for children (0–12 years), with adults wearing masks. Reports of infections were rare: 25 situations with one case without secondary transmission; four situations with possible secondary transmission [9].

This reduced ability of children to transmit the infection appears to be independent of the viral load measured by polymerase chain reaction (PCR), which seems to be the same in symptomatic children and adults [10,11], or is even higher in young children [12].

3.2. Epidemiological data suggest that a child exposed to an infectious case is less likely to become infected than an adult

In a recent general review on the effect of age on the transmission of SARS-CoV-2 in households, schools, and the community, Golstein et al. concluded that there was evidence that susceptibility to infection in children under the age of 10 years was significantly lower compared with adults [13]. This conclusion is indeed supported by epidemiological data from many countries. In Iceland, targeted screening of at-risk individuals showed a 6.7% positivity rate in children under 10 years of age compared with 13.7% in those older than 10. In population-based screening without risk factors, the positivity rate was 0% in children under 10 years of age compared with 0.8% in those older than 10 [14]. Current French epidemiological data are consistent with this. In week 33, the lowest incidence rate (per 100,000 inhabitants) was in the 0–14 age group (8.4), compared with 43.1 in the 15–44 age group, 19.5 in the 45–64 age group, 10.1 in the 65–74 age group, and 11.4 in the 75 and over age group [15]. Data from the French GPIP-ACTIV pediatric network showed that the risk of PCR positivity during the epidemic period (March–April 2020) was 3 times higher in adults than in children [16]. The UK experience is identical to the one in France. Children under 16 years of age represented 1.1% of proven cases. The rate of positive tests was very low in children compared with adults [17]. Data from the United States confirmed a low prevalence of SARS-CoV-2 infection in children who were asymptomatic and who were tested by PCR before surgery, clinic visits, or hospital admissions [18]. The pooled prevalence of infection was 0.65% (95% CI: 0.47–0.83), but varied from 0 to 2.2% in a linear relationship with the mean weekly incidence of COVID-19 for the entire population of the same geographical area. Prevalence in asymptomatic children remained below 1% as long as the weekly incidence in the general population remained below 70/100,000. It reached 1.5% if this incidence rose to 120/100,000 (asymptomatic pediatric prevalence = 1.07 × weekly incidence [no. per 1000 general population] + 0.23) [18]. In an intrafamily transmissibility study analyzing 105 index patients and 392 home contacts, the secondary attack rate was 2.3% in children aged 0–5 years, 5.4% in those aged 6–17 years, and 17.1% in adults [19]. In Greece, the analysis of 23 family clusters showed that the adult was the first identified case in 91.3% of cases. Adult-to-adult transmissions were identified in 12 clusters, and adult-to-child transmissions in 19 clusters. There was no evidence of child-to-child or child-to-adult transmission [20]. In Hunan (China), retrospective analysis of 210 clusters showed that only 8 of 210 clusters (3.5%) were linked to asymptomatic patients. The risk of transmission was increased at home. Susceptibility to infection increased with age. The number of infected contacts from index cases under 20 years of age was very low [21]. In a model based on multinational data, the susceptibility to infection in children was estimated to be half that of adults (0.40 [0.25–0.57] in 0–9-year-olds vs. 0.88 [0.70–0.99] in 60–69-year-olds) [22]. In the most recent meta-analysis, the average rate of secondary attack at home (10 studies) was 31.0% (95% CI: 19.4–42.7%) for adults and 15.7% (9.9–21.5%) for children under 18 years of age [23].

Only one recent study showed a strong pediatric transmission [24]. After exposure to a teenage staff member in a camp without any particular prevention measures, the attack rate was 51% in children aged 6–10 years and 44% in those aged 11–17 years; 26% of the infections were asymptomatic. This study gave few details on the epidemiological links, but suggested avoiding situations of very close exposure without appropriate measures. Somewhat similar to this study, an outbreak was described in a high school in Israel, during the reopening of schools, with an attack rate of 13.2% among teenagers and 16.6% among teachers [25]. This study was, however, not very informative because the conditions of the outbreak were very particular (no prevention measures, heatwave, air conditioning), the modes of transmission were not described, and intrafamily screening was not reported. Like the experience of the Georgian camp, it nevertheless suggests avoiding situations of close exposure in high school without appropriate prevention measures.

3.3. Infected children are more likely to be asymptomatic, and hospitalization of severe forms is rare

In the intrafamily transmission study conducted in Switzerland, 57% of infected children were asymptomatic, compared with only 15% of infected adults [5]. Similarly, the intrafamily transmission study carried out in Greece showed that 40% of infected children were asymptomatic, compared with 10.5% of infected adults [20]. In France, studies conducted in Crépy-en-Valois schools showed that 41.4% of seropositive children reported no symptoms, compared with only 9.9% of seropositive adults [26]. In a model based on multinational data, the fraction of symptomatic infections was 21% (12–31%) in children aged 10–19 years, compared with 69% (57–82%) in people over 70 years of age [22]. In France, children aged 0–14 years account for 1% of hospitalized patients (1033/83,756, on 18/08/2020) [15]. Pediatric deaths are exceptional [27,28].

3.4. The educational and social benefits provided by school far outweigh the risks of a possible SARS-CoV-2 contamination of children in school environments

The consequences of school closures during the lockdown imposed in many countries are multiple and concern numerous aspects: educational, economic, health, family, and abuse [29]. The most vulnerable children were the most affected by school closures. Preexisting vulnerabilities have been exacerbated, and inequalities have worsened, particularly in access to high-quality distance education [29,30]. The reopening of schools with the physical presence of pupils is therefore an objective shared by all pediatric societies around the world. A recent editorial made a strong case for schools reopening [31]. The admission of children to school should be made on the condition that transmissibility in the population is reduced, or better still eliminated, through testing and supervision. The number of pediatric cases in the community will be lower if the viral circulation in the population is low, intrafamily transmission being predominant. It is particularly crucial to set up a rapid screening strategy around adult cases, targeting as a priority the circle of close relatives. The risk of an epidemic in a community of children will also be lower if adult staff in the establishments follow strict health measures, since transmission in communities is mainly from adults to adults or from adults to children.

4. Guidance for school re-entry: Guidelines of the French Pediatric Society

4.1. Back-to-school is possible for every child, under mitigation strategies (e.g., hand hygiene practices, social distancing, and cloth face coverings when indicated).

- Children without comorbidities must be able to go back to school normally.
- All children with chronic diseases must be able to go back to school normally, unless an exception is validated by the child's referring specialist.
- In primary, middle, and high schools, soap or hand sanitizer distribution stations should be provided at least at the entrances of schools classrooms, and education about their regular use should be provided. For children < 6 years of age, education about regular handwashing is essential.
- All adult staff in schools must wear masks at all times.
- Wearing a mask by middle and high school students is useful. It can be less restrictive in classes where physical distancing is possible.

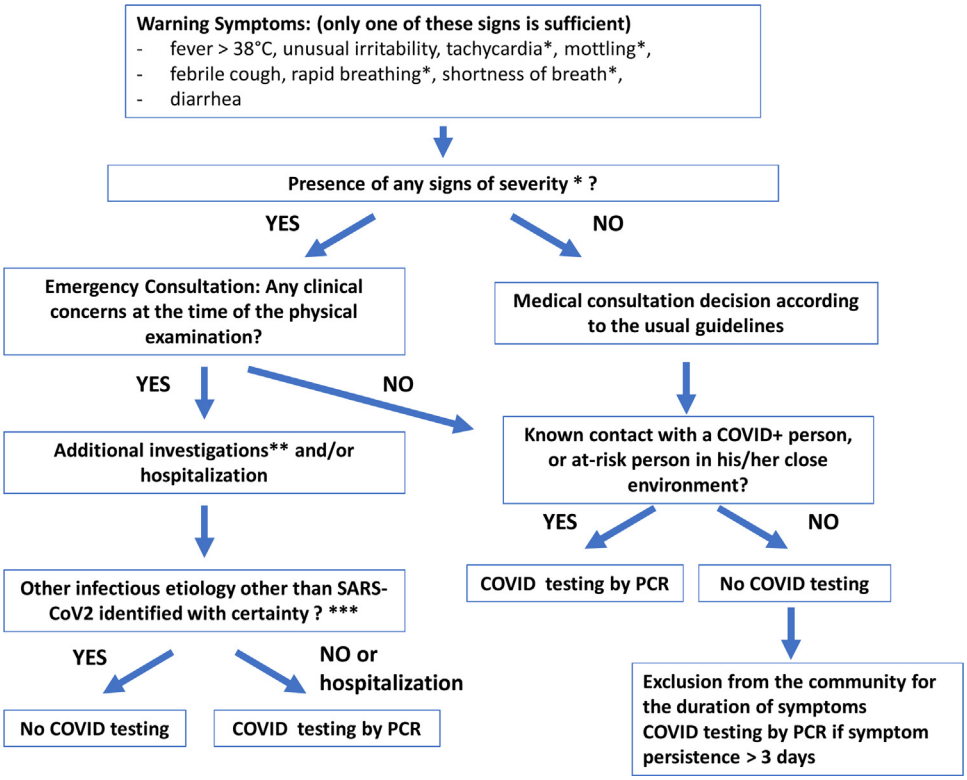

Fig. 1. Decision tree for COVID testing by PCR of children under 6 years of age. *Signs of severity; **Do not forget the differential diagnosis of severe bacterial infection; ***For example, diagnosis of acute pyelonephritis without associated respiratory signs, strep throat, chicken pox.

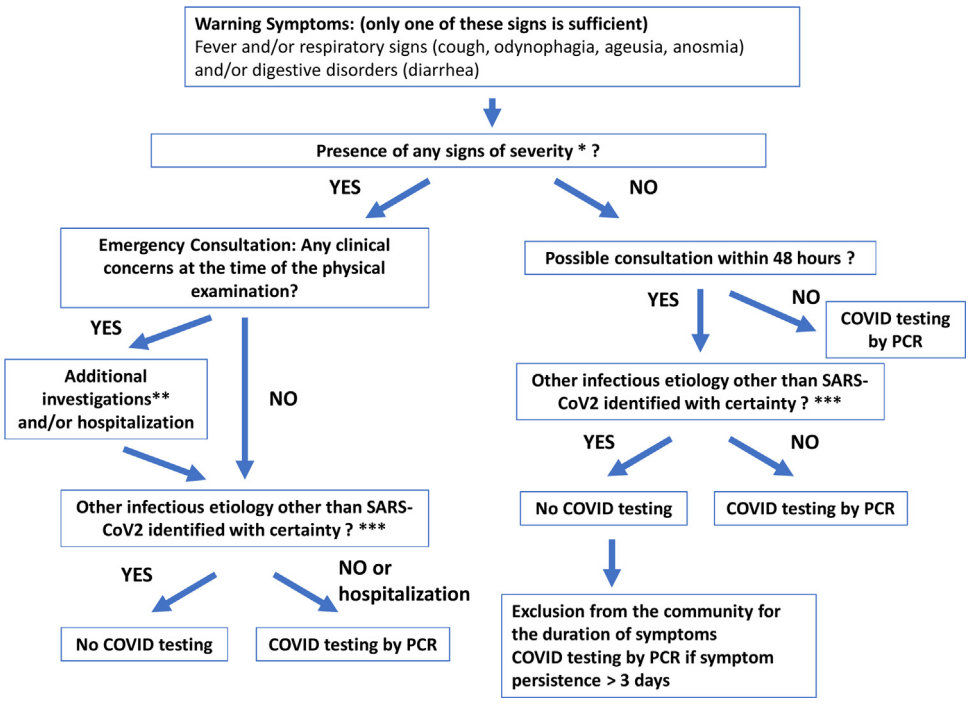

Fig. 2. Decision tree for COVID testing by PCR of children over 6 years of age. *Signs of severity: signs of sepsis, severity of respiratory distress; **Do not forget the differential diagnosis of severe bacterial infection; ***For example, diagnosis of acute pyelonephritis without associated respiratory signs, strep throat, chicken pox.

4.2. Indications for PCR testing should be proportionate to children's small contribution to the transmission of infection (Figs. 1 and 2)

- Apart from any notion of contact, systematic screening for asymptomatic forms in children in the community is useless, because of the weak transmission role of children.
- Any child exposed in his or her home to a COVID+ person must be tested before returning to the community. If the child is asymptomatic, he or she may return to the community if the test result is negative. This return must not compromise the isolation of infected persons in the home.
- Any symptomatic child of at least 6 years of age or adolescent (with cough, and/or fever, and/or digestive disorders) must be screened before returning to the community unless a diagnosis of another infectious disease is made with certainty (e.g., scarlet fever, streptococcal tonsillopharyngitis, clinical enteroviral entities such as herpangina or foot hand mouth syndrome, urinary tract infections, etc.).
- In symptomatic children under 6 years of age (nurseries/daycare centers and kindergartens), the high frequency of viral infections during the autumn and winter, combined with the low transmissibility of COVID-19 by young children, should reserve the indications for COVID PCR to:
  - patients requiring hospitalization or those severe enough to warrant further investigations;
  - children who have had contact with a COVID+ proven case;
  - children in contact at home with persons considered at risk for severe forms of COVID-19;
  - children whose symptoms do not improve within the usual timeframe for respiratory infections (e.g., more than 3 days for fever).
- Screening of an entire class is only warranted if one teacher in the class is COVID+ or if at least two children in the class are symptomatic and COVID+. The rarity of child-to-child transmission does not justify initiating a whole class screening based on an isolated case of symptomatic or asymptomatic children.

4.3. Limit school absenteeism by targeting temporary exclusions of infected children

- All COVID+ children should be excluded from class for 7 days, and possibly longer if symptoms persist. PCR monitoring is not necessary for a return to school or to DCC, as transmissibility is now shown to be maximal during the pre-symptomatic period and low 7 days after the beginning of symptoms.
- If a child tests positive for COVID-19 (intrafamily or community screening) and is asymptomatic, the 7-day exclusion rule applies. A negative PCR test is not required for return to school or to DCC.
- Any child who is symptomatic, but without an indication for a COVID PCR, is excluded from school or DCC for the duration of the symptoms. A COVID PCR is only required if symptoms persist beyond day 3.
- Class closure is justified only if at least three children are infected with COVID-19 in the same class.
- Limit the other causes of digestive and/or respiratory symptoms by developing a policy to encourage vaccination against influenza and rotavirus.

Disclosure of interest

The authors declare that they have no competing interest.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.arcped.2020.09.001.

References

[1] French Pediatric Society. [Proposals from the French Pediatric Society and the societies of pediatric specialties to promote the return of chronically ill children to their schools] (in French); 2020, https://www.sfpediatrie.com/sites/www.sfpediatrie.com/files/medias/documents/propositions_sfp_pathologies_chroniques.pdf.

[2] Heavey L, Casey G, Kelly C, et al. No evidence of secondary transmission of COVID-19 from children attending school in Ireland, 2020. Euro Surveill 2020;25:2000903.

[3] Ismail S, Saliba V, Lopez Bernal J, et al. SARS-CoV-2 infection and transmission in educational settings: cross-sectional analysis of clusters and outbreaks in England; 2020, https://www.medrxiv.org/content/10.1101/2020.08.21.20178574v1.

[4] Jing QL, Liu MJ, Zhang ZB, et al. Household secondary attack rate of COVID-19 and associated determinants in Guangzhou, China: a retrospective cohort study. Lancet Infect Dis 2020 [S1473-3099(20):30471-0].

[5] Posfay-Barbe KM, Wagner N, Gauthey M, et al. COVID-19 in children and the dynamics of infection in families. Pediatrics 2020;146:e20201576.

[6] Macartney K, Quinn HE, Pillsbury AJ, et al. Transmission of SARS-CoV-2 in Australian educational settings: a prospective cohort study. Lancet Child Adolesc Health 2020 [Online ahead of print].

[7] Danis K, Epaulard O, Benet T, et al. Cluster of Coronavirus Disease 2019 (COVID-19) in the French Alps, February 2020. Clin Infect Dis 2020;71:825–32.

[8] Park YJ, Choe YJ, Park O, et al. Contact tracing during Coronavirus disease outbreak, South Korea, 2020. Emerg Infect Dis 2020;26 [Online ahead of print].

[9] Link-Gelles R, DellaGrotta AL, Molina C, et al. Limited Secondary Transmission of SARS-CoV-2 in Child Care Programs – Rhode Island, June 1-July 31, 2020. MMWR Morb Mortal Wkly Rep 2020;69:1170–2.

[10] Jones TC, Mühlemann B, Veith T, et al. An analysis of SARS-CoV-2 viral load by patient age; 2020, https://www.medrxiv.org/content/10.1101/2020.06.08.20125484v1.

[11] L'Huillier AG, Torriani G, Pigny F, et al. Culture-competent SARS-CoV-2 in nasopharynx of symptomatic neonates, children, and adolescents. Emerg Infect Dis 2020;26 [Online ahead of print].

[12] Heald-Sargent T, Muller WJ, Zheng X, et al. Age-related differences in nasopharyngeal severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) levels in patients with mild to moderate coronavirus disease 2019 (COVID-19). JAMA Pediatr 2020 [Online ahead of print].

[13] Goldstein E, Lipsitch M, Cevik M. On the effect of age on the transmission of SARS-CoV-2 in households, schools and the community. medRxiv 2020 [https://www.medrxiv.org/content/10.1101/2020.07.19.20157362v2].

[14] Gudbjartsson DF, Helgason A, Jonsson H, et al. Spread of SARS-CoV-2 in the Icelandic population. N Engl J Med 2020;382:2302–15.

[15] Santé Publique France. [COVID-19: Weekly national and regional epidemiological points] (in French). https://www.santepubliquefrance.fr/dossiers/coronavirus-covid-19/coronavirus-chiffres-cles-et-evolution-de-la-covid-19-en-france-et-dans-le-monde#block-266156 2020.

[16] Levy C, Basmaci R, Bensaid P, et al. Changes in RT-PCR-positive SARS-CoV-2 rates in adults and children according to the epidemic stages. Pediatr Infect Dis J 2020 [Online ahead of print].

[17] Ladhani SN, Amin-Chowdhury Z, Davies HG, et al. COVID-19 in children: analysis of the first pandemic peak in England. Arch Dis Child 2020 [Online ahead of print].

[18] Sola AM, David AP, Rosbe KW, et al. Prevalence of SARS-CoV-2 infection in children without symptoms of coronavirus disease 2019. JAMA Pediatr 2020 [Online ahead of print].

[19] Li W, Zhang B, Lu J, et al. The characteristics of household transmission of COVID-19. Clin Infect Dis 2020;ciaa450 [Online ahead of print].

[20] Maltezou HC, Vorou R, Papadima K, et al. Transmission dynamics of SARS-CoV-2 within families with children in Greece: a study of 23 clusters. J Med Virol 2020 [Online ahead of print].

[21] Hu S, Wang W, Wang Y, et al. Infectivity, susceptibility, and risk factors associated with SARS-CoV-2 transmission under intensive contact tracing in Hunan, China; 2020, https://www.medrxiv.org/content/10.1101/2020.07.23.20160317v2.

[22] Davies NG, Klepac P, Liu Y, et al. Age-dependent effects in the transmission and control of COVID-19 epidemics. Nat Med 2020;26:1205–11.

[23] Madewell ZJ, Yang Y, Longini IM, et al. Household transmission of SARS-CoV-2: a systematic review and meta-analysis of secondary attack rate; 2020, https://www.medrxiv.org/content/10.1101/2020.07.29.20164590v1.

[24] Szablewski CM, Chang KT, Brown MM, et al. SARS-CoV-2 transmission and infection among attendees of an overnight camp – Georgia, June 2020. MMWR Morb Mortal Wkly Rep 2020;69:1023–5.

[25] Stein-Zamir C, Abramson N, Shoob H, et al. A large COVID-19 outbreak in a high school 10 days after schools' reopening, Israel, May 2020. Euro Surveill 2020;25:2001352.

[26] Fontanet A, Grant R, Tondeur L, et al. SARS-CoV-2 infection in primary schools in northern France: a retrospective cohort study in an area of high transmission; 2020, https://www.medrxiv.org/content/10.1101/2020.06.25.20140178v2.

[27] Gotzinger F, Santiago-Garcia B, Noguera-Julian A, et al. COVID-19 in children and adolescents in Europe: a multinational, multicentre cohort study. Lancet Child Adolesc Health 2020;4:653–61.

[28] Oualha M, Bendavid M, Berteloot L, et al. Severe and fatal forms of COVID-19 in children. Arch Pediatr 2020;27:235–8.

[29] European Network of Ombudspersons for Children (ENOC) and UNICEF. ENOC-UNICEFF-COVID-19-survey-updated-synthesis-report; 2020, http://enoc.eu/wp-content/uploads/2020/06/ENOC-UNICEFF-COVID-19-survey-updated-synthesis-report-FV.pdf?bcsi_scan_08276ca4327756e4=1.

[30] American Academy of Pediatrics. COVID-19 planning considerations: guidance for school re-entry; 2020, https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/clinical-guidance/covid-19-planning-considerations-return-to-in-person-education-in-schools/.

[31] Levinson M, Cevik M, Lipsitch M. Reopening primary schools during the pandemic. N Engl J Med 2020 [Online ahead of print].