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- 8 Wheatley AK, Juno JA, Wang JJ, et al. Evolution of immune responses to SARS-CoV-2 in mild-moderate COVID-19. *Nat Commun* 2021; **12**: 1–11.
- 9 Gaebler C, Wang Z, Lorenzi JCC, et al. Evolution of antibody immunity to SARS-CoV-2. *Nature* 2021; **591**: 639–44.
- 10 Bernal JL, Andrews N, Gower C, et al. Effectiveness of COVID-19 vaccines against the B.1.617.2 variant. *medRxiv* 2021; published online May 24 (preprint).
- 11 Sheikh A, McMenamin J, Taylor B, Robertson C, on behalf of Public Health Scotland and the EAVE II Collaborators. SARS-CoV-2 Delta VOC in Scotland: demographics, risk of hospital admission, and vaccine effectiveness. *Lancet* 2021; **397**: 2461–62.
- 12 Wyllie D, Jones HE, Mulchandani R, et al. SARS-CoV-2 responsive T cell numbers and anti-Spike IgG levels are both associated with protection from COVID-19: a prospective cohort study in keyworkers. *medRxiv* 2020; published online Nov 4. <https://doi.org/10.1101/2020.11.02.20222778> (preprint).
- 13 Joint Committee on Vaccination and Immunisation, Department of Health and Social Care. JCVI interim advice on a potential coronavirus (COVID-19) booster vaccine programme for winter 2021 to 2022. June 30, 2021. <https://www.gov.uk/government/publications/jcvi-interim-advice-on-a-potential-coronavirus-covid-19-booster-vaccine-programme-for-winter-2021-to-2022> (accessed July 6, 2021).
- 14 Hillus D, Schwarz T, Tober-lau P, et al. Safety, reactogenicity, and immunogenicity of homologous and heterologous prime-boost immunisation with ChAdOx1-nCoV19 and BNT162b2: a prospective cohort study. *medRxiv* 2021; published online June 2. <https://doi.org/10.1101/2021.05.19.21257334> (preprint).
- 15 Barros-Martins J, Ramos GM, Dopfer-Jablunka A, et al. Humoral and cellular immune response against SARS-CoV-2 variants following heterologous and homologous ChAdOx1 nCoV-19 / BNT162b2 vaccination. *medRxiv* 2021; published online June 3. <https://doi.org/10.1101/2021.06.01.21258172> (preprint).

Education and mental health: good reasons to vaccinate children

With the elevated transmissibility of circulating SARS-CoV-2 variants, vaccination coverages as high as 90% in adults might be necessary to fully relax control measures towards the end of 2021.¹ Such targets might be hard to reach because of vaccine hesitancy. Therefore, there is a risk that COVID-19 might cause substantial stress on health care in the winter months at the end of 2021 and

beginning of 2022. Modelling data suggest that vaccination of children and adolescents could help mitigate this risk of SARS-CoV-2 dissemination by ensuring they do not act as a reservoir.¹ However, since COVID-19 is mild in children,² such intervention might be ethically problematic if the population benefits come without individual benefits for children. Here, we argue that vaccinating children and adolescents is important to secure their continued access to education and protect their mental health.

In the event of a COVID-19 epidemic rebound during the winter months, we anticipate that control strategies will evolve to preferably target unvaccinated individuals, accounting for the reduced contribution of vaccinated individuals to disease spread. Living with children aged 11–17 years increases the risk of SARS-CoV-2 infection by 18–30%.³ This contribution to disease spread could substantially increase once children are the only unvaccinated group, leading to a larger proportion of infections and clusters occurring in schools. Although such clusters might be tolerated if the rate of admission to hospital remains low, there is a point beyond which class closures might be reinstated. These closures would be highly detrimental to the education and wellbeing of children and adolescents who have had their schooling increasingly disrupted.⁴ School closure can affect learning, lead to anxiety and depressive symptoms, exacerbate tensions or even intrafamily violence, and deepen social inequalities.

Early data from clinical trials suggest that the BNT162b2 mRNA COVID-19 vaccine (Pfizer-BioNTech) is safe and highly immunogenic in adolescents aged 12–15 years.⁵ On May 10, 2021, the US Food and Drug Administration, followed by the European Medicines Agency on May 28, 2021, extended the use of this vaccine to include adolescents aged 12–15 years. Side-effects in vaccinated adolescents

should be carefully monitored at population level to make sure that rare but severe side-effects will not go unnoticed. As data from ongoing trials in children younger than 12 years become available, vaccination in younger age groups could be considered.

At a time when we all want to return to normal life, we cannot ignore the fact that children share the same aspirations. The vaccination of children against COVID-19 would be the best way to insulate them from the risk of class closures, secure their continued access to education, and protect their mental health.

We declare funding from Investissement d'Avenir programme, the Laboratoire d'Excellence Integrative Biology of Emerging Infectious Diseases programme, and the EU's Horizon 2020 research and innovation programme. The funders had no role in the writing of or decision to submit this Correspondence.

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- 1 Tran Kiem C, Massonnaud C, Levy-Bruhl D, et al. Short and medium-term challenges for COVID-19 vaccination: from prioritisation to the relaxation of measures. *EClinicalMedicine* (in press).
- 2 Hoang A, Chorath K, Moreira A, et al. COVID-19 in 7780 pediatric patients: a systematic review. *EClinicalMedicine* 2020; **24**: 100433.
- 3 Galmiche S, Charmet T, Schaeffer L, et al. Exposures associated with SARS-CoV-2 infection in France: a nationwide online case-control study. *Lancet Reg Health Eur* 2021; **7**: 100148.
- 4 YoungMinds. Coronavirus: impact on young people with mental health needs. London: YoungMinds, 2021.
- 5 Frencck RW, Klein NP, Kitchin N, et al. Safety, immunogenicity, and efficacy of the BNT162b2 COVID-19 vaccine in adolescents. *New Engl J Med* 2021; published online May 27. <https://doi.org/10.1056/NEJMoa2107456>.



Europa Press News/Getty Images

Published Online
July 14, 2021
[https://doi.org/10.1016/S0140-6736\(21\)01453-7](https://doi.org/10.1016/S0140-6736(21)01453-7)