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Transmissibility of SARS-CoV-2 among fully vaccinated individuals

Vaccine effectiveness studies have conclusively demonstrated the benefit of COVID-19 vaccines in reducing individual symptomatic and severe disease, resulting in reduced hospitalisations and intensive care unit admissions.¹ However, the impact of vaccination on transmissibility of SARS-CoV-2 needs to be elucidated. A prospective cohort study in the UK by Anika Singanayagam and colleagues² regarding community transmission of SARS-CoV-2 among unvaccinated and vaccinated individuals provides important information that needs to be considered in reassessing vaccination policies. This study showed that the impact of vaccination on community transmission of circulating variants of SARS-CoV-2 appeared to be not significantly different from the impact among unvaccinated people.^{2,3} The scientific rationale for mandatory vaccination in the USA relies on the premise that vaccination prevents transmission to others, resulting in a “pandemic of the unvaccinated”.⁴ Yet, the demonstration of COVID-19 breakthrough infections among fully vaccinated health-care workers (HCW) in Israel, who in turn may transmit this infection to their patients,⁵ requires a reassessment of compulsory vaccination policies leading to the job dismissal of unvaccinated HCW in the USA. Indeed, there is growing evidence that peak viral titres in the upper airways of the lungs and culturable virus are similar in vaccinated and unvaccinated individuals.^{2,3,5-7} A recent investigation by the US Centers for Disease Control and Prevention of an outbreak of COVID-19 in a prison in Texas showed the equal presence of infectious virus in the nasopharynx of vaccinated and unvaccinated individuals.⁶ Similarly, researchers in California observed no major differences between vaccinated and unvaccinated individuals in

terms of SARS-CoV-2 viral loads in the nasopharynx, even in those with proven asymptomatic infection.⁷ Thus, the current evidence suggests that current mandatory vaccination policies might need to be reconsidered, and that vaccination status should not replace mitigation practices such as mask wearing, physical distancing, and contact-tracing investigations, even within highly vaccinated populations.

I declare no competing interests.

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- 1 Thompson MG, Stenehjem E, Grannis S, et al. Effectiveness of COVID-19 vaccines in ambulatory and inpatient care settings. *N Engl J Med* 2021; **385**: 1355–71.
- 2 Singanayagam A, Hakki S, Dunning J, et al. Community transmission and viral load kinetics of the SARS-CoV-2 delta (B.1.617.2) variant in vaccinated and unvaccinated individuals in the UK: a prospective, longitudinal, cohort study. *Lancet Infect Dis* 2021; published online Oct 29. [https://doi.org/10.1016/S1473-3099\(21\)00648-4](https://doi.org/10.1016/S1473-3099(21)00648-4).
- 3 Wilder-Smith A. What is the vaccine effect on reducing transmission in the context of the SARS-CoV-2 delta variant? *Lancet Infect Dis* 2021; published online Oct 29. [https://doi.org/10.1016/S1473-3099\(21\)00690-3](https://doi.org/10.1016/S1473-3099(21)00690-3).
- 4 Tayag Y. Stop calling it a pandemic of the unvaccinated. *The Atlantic*. Sept 21, 2021. <https://www.theatlantic.com/ideas/archive/2021/09/persuade-unvaccinated-protect-unvaccinated/620091/> (accessed Sept 30, 2021).
- 5 Bergwerk M, Gonen T, Lustig Y, et al. COVID-19 breakthrough infections in vaccinated health care workers. *N Engl J Med* 2021; **385**: 1474–84.
- 6 Hagan LM, McCormick DW, Lee C, et al. Outbreak of SARS-CoV-2 B.1.617.2 (delta) variant infections among incarcerated persons in a federal prison—Texas, July–August 2021. *MMWR Morb Mortal Wkly Rep* 2021; **70**: 1349–54.
- 7 Acharya CB, Schrom J, Mitchell AM, et al. No significant difference in viral load between vaccinated and unvaccinated, asymptomatic and symptomatic groups infected with SARS-CoV-2 delta variant. *medRxiv* 2021; published online Sept 29. <https://doi.org/10.1101/2021.09.28.21264262> (preprint).

With interest we read the paper by Anika Singanayagam and colleagues¹ assessing the secondary attack rate (SAR) of SARS-CoV-2 in 204 vaccinated and unvaccinated household contacts exposed to

138 vaccinated and unvaccinated index cases. Here, we want to point out the importance of adjusting for age when comparing vaccinated and unvaccinated individuals.

The authors report a similar SAR among household contacts exposed to fully vaccinated and unvaccinated index cases (25% and 23%). Although not explicitly stated by the authors, this finding hints towards no effect of vaccination on transmission and was reported as such by the media in the UK and the Netherlands—and possibly other countries.^{2,3} However, age is a confounding factor in this observation if age is associated with both vaccination status and the risk of transmitting SARS-CoV-2. Indeed, the study indicates a higher peak viral load with increasing age, consistent with lower infectiousness in children. In addition, although the age distribution of all included index cases and contacts is not presented, table S2 in the appendix to the Article provides data for a subset of participants testing positive for SARS-CoV-2, showing that a large proportion (78%) of unvaccinated participants were younger than 18 years, whereas none of the vaccinated participants were. These findings together suggest that the infectiousness of the included unvaccinated index cases was lower than that of the included vaccinated participants because of younger age. Therefore, the presumed lack of vaccine effect on transmission might be largely due to confounding by age, which the authors did not address. In our analysis of vaccine effectiveness against transmission in the Netherlands, adjustment for age of index cases and contacts indeed had a large effect on vaccine effectiveness estimates.⁴ Therefore, vaccine effectiveness against transmission reported by Singanayagam and colleagues is probably an underestimate.

Also, the reported vaccine effectiveness against SARS-CoV-2 infection (34%) is likely confounded