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# Effectiveness of covid-19 vaccines in adolescents and children

## Evidence continues to support vaccination

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Although children and adolescents generally have a milder form of covid-19 than adults, some young people develop a severe illness leading to hospital admission or even death. Children can also develop complications, such as multisystem inflammatory syndrome in children and long covid syndrome.<sup>1</sup> Furthermore, after the emergence of the omicron variant and the loosening of social distance measures, cases of covid-19 rose sharply among younger age groups, further disrupting schools and adding to communities' public health burdens. Perhaps unsurprisingly, and after careful scrutiny of safety data, public health authorities in many countries approved and strongly promoted covid-19 vaccination for adolescents and, later on, children.

Castelli and colleagues' recent *BMJ* study (<https://doi.org/10.1136/bmj.2022-073070>) is a welcome addition to a rapidly growing literature evaluating the effectiveness of covid-19 vaccines in children and adolescents with real world data.<sup>2</sup> These age groups were under-represented in pre-authorisation trials of covid-19 vaccines. So as vaccination programmes for under 18s advanced, an important opportunity arose to quantify protection against mild and severe covid-19 achieved in these age groups and to determine whether it was somehow different from the protection achieved in adults.

The authors report important findings from a test negative, matched case-control study, including 139 321 pairs of cases (positive SARS-CoV-2 test) and controls among children and adolescents aged from 3 to 17 years. They found that protection from mild infection among children and adolescents waned quickly over time during the period when the omicron variant dominated, as it had in adults.<sup>1,3</sup> However, estimates of effectiveness were lower and fell more steeply among children vaccinated with the inactivated vaccine BBIBP-CorV (from 37.6% to 2%) than among adolescents vaccinated with mRNA based vaccines (from 55.8% to 12.4%). The authors also estimated vaccine effectiveness against deaths related to SARS-CoV-2: again, protection was lower among children (67%, 95% confidence interval 6.4% to 89.8%) compared with adolescents (97.6%, 81.0% to 99.7%). These results align with those of other studies, which also reported waning protection against infection and lower estimates of effectiveness against mild and severe covid-19 in studies of children compared with studies of adolescents during the omicron dominant period.<sup>4-8</sup>

The evidence to date still leaves important unanswered questions, however. Is covid-19 vaccination truly less effective for children than other age groups? If so, what could explain this discrepancy? A few points must be considered when

interpreting effectiveness studies in children. Firstly, studies in children can be difficult owing to the specific characteristics of covid-19 in this age group. For example, children with SARS-CoV-2 infections tend to have mild or no symptoms; this could lead to many undetected infections and an underestimate of vaccine effectiveness. Secondly, children are far more likely than adults to become infected with other respiratory viruses, perhaps leading to missed diagnoses and misdiagnoses. A third and critical limitation is the low rate of severe disease and death in this age group, leading to a lack of power in analyses of these outcomes and wide confidence intervals around estimates in studies of children under 12.

Finally, debate persists around whether the reduced dose of mRNA vaccines (Pfizer-BioNTech and Moderna) given to children under 12 years could lead to lower levels of protection. Some preliminary data showed lower effectiveness from the reduced dose (10 µg) of mRNA vaccine (Pfizer-BioNTech) administered to children of 11 years compared with adolescents aged 12 years receiving a full dose (30 µg).<sup>9</sup> However, vaccine effectiveness in children seems to be lower than in adults (against mild or severe disease), even for those given inactivated virus vaccines that contain the same dose for both adults and children.<sup>1,5-7</sup>

The scientific community is still debating how best to study the effectiveness of covid-19 vaccine in children, but some level of protection against mild and severe outcomes has been established. The safety of covid-19 vaccines in this age group is well supported, although results for rare outcomes are still under investigation, and surveillance must continue.<sup>10-13</sup> Although more research is needed on vaccines' effectiveness at reducing transmission in the context of emerging variants, sufficient scientific support exists for public health authorities to continue to promote vaccines to children and adolescents. Further real world studies will help to answer the remaining questions surrounding vaccine effectiveness in this age group. Meanwhile, in addition to vaccines, non-drug interventions remain central to containing the burden of disease at the community level.<sup>14</sup>

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