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Correspondence to: Estimating the full health and economic benefits of current and future influenza vaccines

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Abstract

We recently published an article in *BMC Medicine* looking at the potential health and economic impact of paediatric vaccination using next-generation influenza vaccines in Kenya: a modelling study. In their commentary on our article, Lafond et al. highlight the potential importance of the wider benefits of vaccination on cost-effectiveness. Whilst we agree with many points raised in the commentary, we think it raises further interesting discussion points, specifically around model complexity, model assumptions and data availability. These points are both relevant to this manuscript but have wider implications for vaccine cost-effectiveness studies.

Keywords Influenza, Vaccines, Next-generation vaccines, Cost-effectiveness, Burden, Mathematical modelling, Complexity, Assumptions

Commentary

We thank Lafond et al. for their commentary on our cost-effectiveness analysis of next-generation influenza vaccines [1]. Lafond et al. raise some important points, highlighting the conservative nature of our estimates of the cost-effectiveness of influenza vaccines. Our study was limited by the data available, and we therefore agree we could not include some wider benefits that would potentially increase the economic impacts of both current and next-generation influenza vaccines.

Lafond et al.'s commentary raises some further discussion points, firstly, the complex and important role of assumptions in the modelling work. For example, they discuss that vaccine effectiveness assumptions made

may not capture the full benefits, as we do not consider the disease-modifying effects of vaccination but instead assume that vaccine immunity is sterilising (i.e. vaccinees are either fully protected against infection or not protected at all). Whilst this may result in underestimating benefits if vaccines are also highly effective against disease, it may also result in an overestimate of the benefits, because sterilising immunity in the model gives both direct protection of the individual and indirect protection to others—you cannot transmit influenza if you do not get infected. If the vaccine is instead only disease-modifying, transmission will still occur, potentially increasing the number of cases while decreasing the chance of severe disease. This demonstrates that changing assumptions has complex effects, and in our analysis, we aimed for an appropriate balance whilst acknowledging the limitations of such assumptions.

The second area of discussion raised is the inclusion of broader benefits of vaccination, such as the impact on antimicrobial resistance (AMR). Lafond et al. rightly highlight the importance of these benefits, and that in some circumstances it can be viable to quantify them.

This comment refers to the article available online at <https://doi.org/10.1186/s12916-023-02995-4>.

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For our study however, local information needed for this, for example on age-specific antimicrobial prescribing for influenza, was not available. AMR rates vary enormously by location, both nationally and sub-nationally [2] and therefore using information from further afield in our Kenya analysis could be inappropriate. As Lafond et al. note, even wider impacts such as health equity could also have been included, but are beyond the scope of this (and many other) cost-effectiveness studies.

We agree with Lafond et al. that it is important to raise awareness of the wider benefits of influenza vaccines that may underpin their full economic value [3, 4] and, where they cannot be easily quantified, to weigh them qualitatively in any decision. Finally, we note that the inclusion of such additional benefits of influenza vaccination would reinforce our main conclusion that next-generation vaccines could be a cost-effective intervention in Kenya.

Abbreviation

AMR Antimicrobial resistance

Acknowledgements

Not applicable

Authors' contributions

NRW, RME, SRP, RME and MJ jointly wrote the response. All authors read and approved the final manuscript.

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Funding

This work was funded by the Wellcome Trust (224690/Z/21/Z) and Centers for Disease Control and Prevention (CDC-RFA-IP21-2103). RME was also supported by the National Institute for Health Research (NIHR) Health Protection Research Unit (HPRU) in Modelling and Health Economics, a partnership between UKHSA, Imperial College London, and LSHTM (grant number NIHR200908).

Availability of data and materials

Not applicable.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Received: 22 May 2023 Accepted: 20 July 2023

Published online: 09 August 2023

References

- Waterlow NR, Radhakrishnan S, Dawa J, van Leeuwen E, Procter SR, Lambach P, et al. Potential health and economic impact of paediatric vaccination using next-generation influenza vaccines in Kenya: a modelling study. *BMC Med.* 2023;21:106.
- Global antimicrobial resistance and use surveillance system (GLASS) report: 2022. Available: <https://www.who.int/publications-detail-redirect/9789240062702>.
- Hutubessy RCW, Lauer JA, Giersing B, Sim SY, Jit M, Kaslow D, et al. The Full Value of Vaccine Assessments (FVVA): a framework to assess and communicate the value of vaccines for investment and introduction decision making. *BMC Med.* 2023.
- Gessner BD, Kaslow D, Louis J, Neuzil K, O'Brien KL, Picot V, et al. Estimating the full public health value of vaccination. *Vaccine.* 2017;35:6255–63.

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Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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