Modelling the epidemiological impact of vaccines against group A *Streptococcus*: Strengths, challenges, and future directions

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BACKGROUND

- Group A *Streptococcus* (Strep A) infection and direct sequelae are a major cause of morbidity and mortality at the global level, with more than half a million deaths and 1.78 million new cases annually attributable to Strep A.
- Strep A causes a broad spectrum of diseases, including pharyngitis, impetigo (skin infections), cellulitis, invasive disease, acute rheumatic fever, rheumatic heart disease (RHD), and acute post-streptococcal glomerulonephritis (kidney disease).
- The WHO published the Preferred Product Characteristics for Strep A vaccines in 2018.

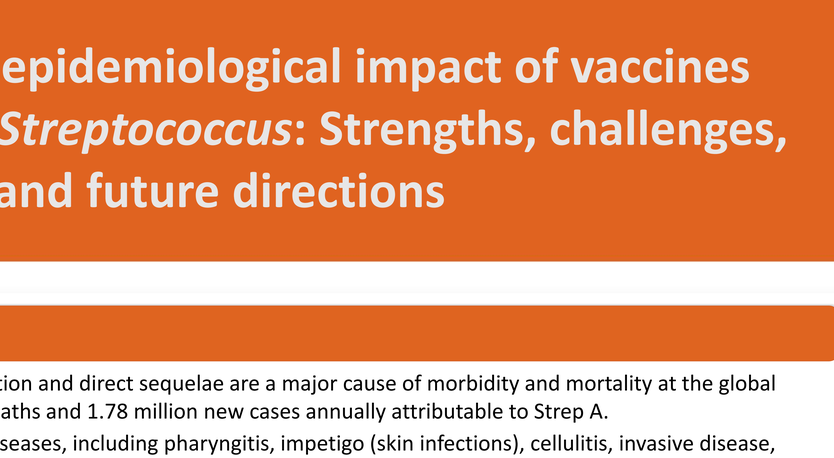
AIM

- To estimate the projected health impact of Strep A vaccination at the global, regional, and national levels and by country-income level.

METHODS

Strep A vaccine impact model

- The static cohort model estimates the projected health impact of Strep A vaccination among the vaccinated cohorts over their lifetime in terms of burden averted for pharyngitis, invasive disease, impetigo, cellulitis, and rheumatic heart disease.
- Several vaccination scenarios were simulated to explore the effects of vaccine efficacy, year of introduction, coverage/uptake, and duration of protection.

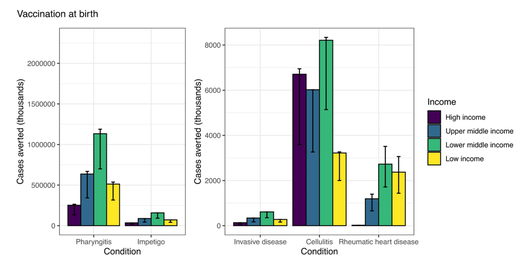


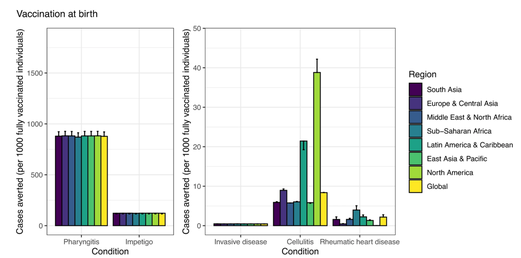
DALYs – Disability adjusted life years
UNWPP – United Nations World Population Prospects
WHO PPC – World Health Organization Preferred Product Characteristics for Group A Streptococcus Vaccines

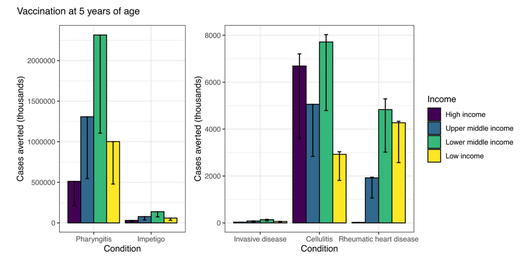
CONCLUSIONS

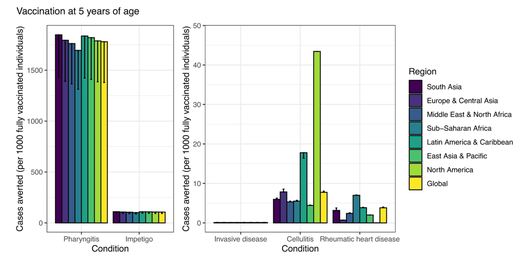
- We developed a flexible model to estimate the health impact of Strep A vaccines at the country, regional, and global levels.
- These estimates are based on burden of Strep A disease data, which varies in strength of evidence between disease manifestation and country, and unknown vaccine efficacy, duration of protection (inclusive of waning rate), and coverage.
- Limitations of the model include overlooking the pathway between infection(s), auto-immune disease, and RHD and Strep A transmission dynamics; further epidemiological research into the interaction between number and anatomical site of infection, inclusive of 'carriage,' on severe disease, as well as transmission dynamics, are required to refine the model.

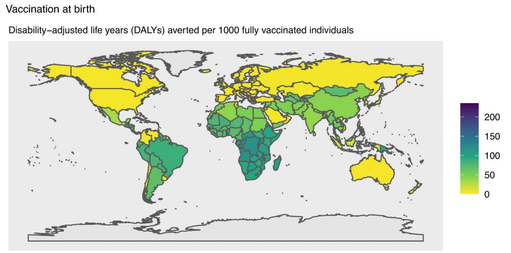
RESULTS

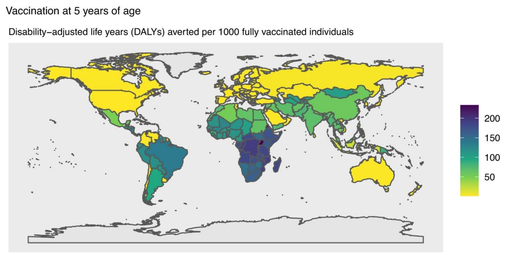












- We analysed strategic scenarios for vaccination at birth and 5 years of age and projected that around one-third of the annual global burden of rheumatic heart disease can be potentially averted by prospective Strep A vaccination.
- Regionally, vaccination impact in terms of burden averted per fully vaccinated individual is highest in North America for cellulitis and in Sub-Saharan Africa for rheumatic heart disease.
- By income level, total vaccine-avertable burdens for pharyngitis, impetigo, invasive disease, cellulitis, and rheumatic heart disease were highest in lower-middle-income countries.

Giannini F, Cannon JW, Cadarette D, Bloom D, Moore H, Carapetis J, Abbas K. Modeling the potential health impact of prospective Strep A vaccines. NPJ Vaccines, 8(90), 2023. DOI: 10.1038/s41541-023-00668-0

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