Predicting the impact of typhoid conjugate vaccines on antimicrobial resistance

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Modeling the impact of typhoid conjugate vaccines (TCVs) on antimicrobial resistance

HYPOTHESIS:
By decreasing the incidence of typhoid fever, and thereby decreasing the number of individuals being treated with antimicrobials, vaccination can decrease selection pressure for transmitted resistance

This will lead to a synergistic benefit by reducing both the incidence and prevalence of resistant strains
Model structure

Model predictions for the impact of TCVs on AMR

Vaccination is predicted to decrease the incidence of typhoid fever, and the incidence of AMR cases, but does NOT affect the proportion of cases that are resistant.

Which parameters affect the proportion of cases that are resistant?

Which parameters affect the proportion of cases averted by vaccination?

Kaufhold et al. (2019) Clin Infect Dis
Impact of vaccination on chronic carriers

Vaccination is predicted to slightly decrease the prevalence of chronic carriers that harbor AMR strains

Limitations

• Simplified model, not fit to data from any particular typhoid-endemic setting
• Proportion of cases treated was assumed constant over time
• We assume vaccination provides equal protection against resistant and sensitive strains
• We assume the reduction in treatment is directly proportional to the incidence of typhoid fever
Impact of TCVs beyond typhoid fever

- Typhoid fever is a major driver of antimicrobial treatment
- For every culture-positive typhoid fever case, there are up to 25 other suspected cases

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