Estimating impact and cost-effectiveness of ending cholera roadmap

Vittal Mogasale

International Vaccine Institute, Seoul, South Korea

5th Annual meeting of GTFCC, 13-14 June
Les Pensieres, Veyrier du Lac, France

International Vaccine Institute

Background

- **Project supported SIDA (May 2018-December 2019)**
- **To add scientific and advocacy value to cholera elimination plan**
- **Not to duplicate investment case work, need to complement**
- **Now developing work plan, seeking inputs**

The plan

- Form a technical advisory committee
- Agree on the broad approach and inputs
- Scope the disease and economic burden (literature reviews)
- Estimate vaccine demand forecast
- Conduct Impact modeling
- Analyze cost-effectiveness

Working mechanism

- **Working group located at IVI** (4 members, 10-25% of time)
- **Formation of technical advisory committee (TAC)**
  - Experts in epidemiology, modeling, health economics, delivery and GTFCC secretariat & Gavi
  - Periodic calls, document reviews, short face to face meeting (linked to GTFCC)
- **Consultation on the methodology, approaches and inputs**
  - Initial presentation at GTFCC meeting (today)
  - Methodology, inputs and assumptions to be finalized in consultation with TAC
  - Work updates in GTFCC meetings for periodic inputs

The outline

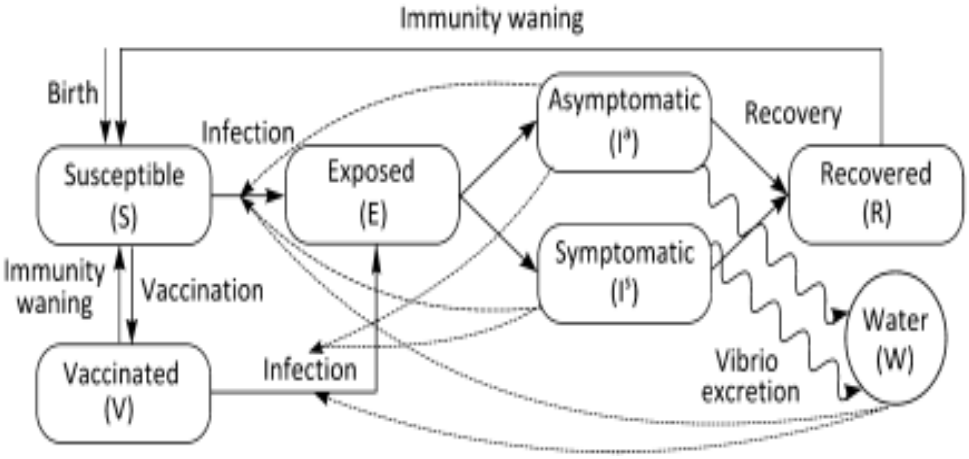
- **Classify countries into 3 groups as defined by GTFCC**
- **Quantify disease and economic burden**
- **Match vaccine demand forecast with Gavi and cholera elimination plan**
- **Model impact of forecasted introduction**
  - WASH improves consistent with current trends vs. accelerated improvement
  - Case management remains same vs. improves by certain %
- **Estimate cost-effectiveness by various scenarios**

Disease and economic burden

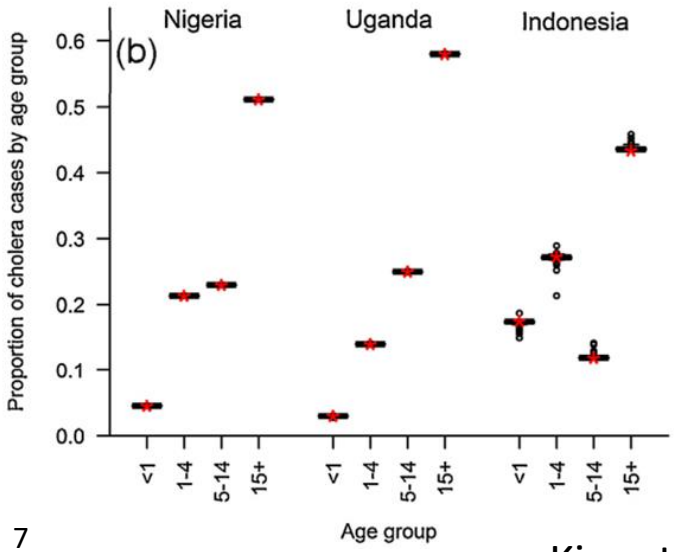
- **Use the published estimates of disease burden and economic burden in order to apply for 3-4 representative regions at the global-level**
- **Apply incidence weighted average values**
- **May require several broad assumptions depending upon the data availability at the global-level**

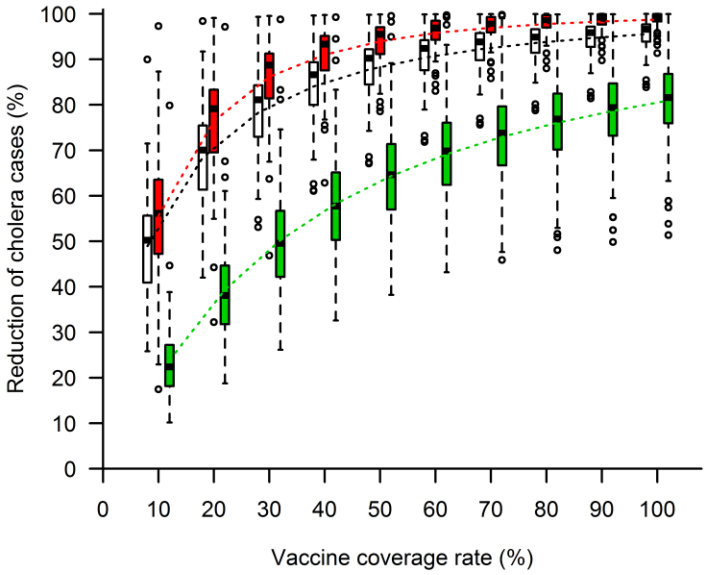
IVI Cholera Transmission Model

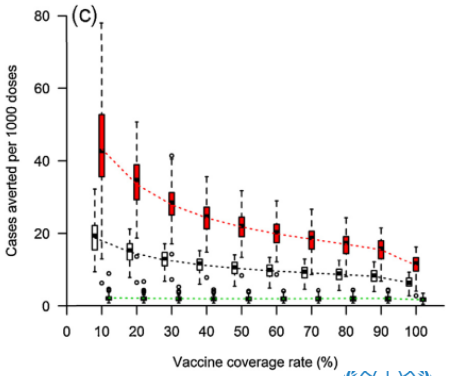
- SEIRW model (person-to-person and water-to-person transmission)
- Population at risk of cholera increases with birth and decreases with death and WaSH improvement over 2015-2030
- Calibrated against annual incidence by age group in 3 countries
- Mass vaccination of 1-14 yo every 3 or 5 years



Nigeria (white), Uganda (red), Indonesia (green)







Kim et al. Vaccine 2016

Proposed model

- **Model**
  - Outbreaks in cholera hotspots
  - Person-to-person transmission (short cycle) or along with water-to-person transmission (long cycle)
  - Classifying outbreaks into sub-categories (e.g., 3 types of WHO country classifications)
  - Calibrated against epidemic curve, possibly with other characteristics (e.g., spatial clustering, etc.)
- **Vaccine impact**
  - Steady & improved interventions such as WaSH/ case management
  - Various vaccination options (e.g., one- vs. two-dose regimen, area-targeted vaccination, and coverage rates)
  - Number of averted cases and deaths (per the number of vaccine doses)

Vaccine demand forecast and program costs

- **Vaccine demand forecast**
  - Estimate the number of vaccine doses required over time (by year) by vaccination strategies and by region/country
  - Populations, vaccine coverage rates, the number of doses per recipient, and wastage rates

- **Program costs**
  - Combine the estimated number of doses with total vaccination program costs
  - Derive overall program costs by vaccination strategy, as well as by region

Cost-effectiveness analysis

- **Standard health economic principles, following 2018 WHO guidelines**
- **Compare total vaccination costs and benefits**
- **Vaccination benefits**
  - Number of cases and deaths averted
  - Treatment costs averted
  - Implications on exports and tourism? Broader societal benefits?
- **Disability adjusted life years (DALYs) as a primary outcome**
- **Cost-effectiveness of the elimination plan**

Comments