Utilizing health economic modeling and translational action to demonstrate vaccine effectiveness for institutions combating AMR

CHW
CENTER FOR HEALTH AND WELLBEING
PRINCETON UNIVERSITY

Elliot Lee, 2026, Econ/ORFE (undecided)
One Health Trust, Bengaluru, Karnataka, India
Funded by CHW under Internships in Global Health (LENS)

**DALYS = disability-adjusted life years
YLD (years lived with disability) + YLL (years of life lost)*

Introduction

➢ Antimicrobial resistance (AMR) refers to growing pathogen response against traditional treatments (i.e. antibiotics), rendering these treatments ineffective.

➢ 1.27 million deaths were attributable to bacterial AMR worldwide in 2019 (Murray et al., 2022)

Objective

➢ Vaccinations have been proven effective in combating AMR by reducing prevalence of resistant pathogens and decreasing inappropriate antibiotic use (Micoli et al., 2021)

➢ Policymakers must be convinced that vaccination initiatives are worthwhile in reducing AMR burden

Work Profile

➢ Contribute to policy briefs detailing the burden of AMR while synthesizing research studies that model vaccine effectiveness

➢ Run and tweak economic models that establish the cost-effectiveness of vaccines in combating AMR

Reflection

Part 1: Research Assistant (supervised by Dr. Giridara Gopal Parameswaran)

➢ Tweaked Markov models demonstrating the cost-benefit effectiveness of vaccines in reducing DALYS* and infectious disease burden across all states and union territories in India excluding data-deficient zones that were noted

➢ Ran Monte Carlo-derived probabilistic sensitivity analyses for all available states and union territories to determine cost-benefit financial incentives for governments to pursue two different vaccination programs, then calculating and organizing obtained data

➢ Model inputs were inherently approached with uncertainty, and thus, represented using appropriate distributions in the analysis

Part 2: Presentation (supervised by Dr. Erta Kalanxhi and Rishi Bhagawati)
Assisting GARP

➢ The Global Antibiotic Resistance Partnership (GARP) helps low- and middle-income countries develop policies to tackle AMR.

➢ Created presentations demonstrating the work of GARP for meetings with the following countries (Tanzania, Zimbabwe, India, Kenya, South Africa, Vietnam, Mozambique, Laos, Nigeria)

➢ Contributor to the following policy briefs on the value of vaccines to mitigate antimicrobial resistance (Pakistan, South Africa, Nepal, Uganda, Nigeria)
  ➢ Wrote sections on infectious disease burden within these countries (for Pakistan, wrote sections including executive summary and the status quo of vaccination programs)

Birth cohort (based on population data) ⟶ **Scenario 2**

Utilization of inputs with uncertainties modeled as distributions

Probabilistic sensitivity analyses are run for the data points provided within the birth cohort

Scenario 1 ⟶ **Cost-benefit analyses determined using stochastic method**

Looking ahead | Conclusions

• Continue to work with Dr. Giri on creation of health economic models using R
• Presentations and policy briefs hopefully play a role in spurring effective vaccination programs in the nations who need them the most
• Internship taught some important basics regarding health economic modeling as well as the government-health interface

Questions

• Examining potential impact that educational level and socioeconomic status have in stratifying access to appropriate AMR treatments, especially relating to information access regarding antibiotic misuse

Acknowledgements