



UK Health  
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Agency

# More than Just About Money: A Journey from Patient to Policymaker



Economic concepts and analyses to support  
effective AMR policymaking

**DISCLAIMER:** *The work presented here does not necessarily reflect the views of the organisations listed/affiliated*



UK Health  
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RESEARCH  
PROGRAM ON  
Agriculture for  
Nutrition  
and Health

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# Why do economic evaluation?

## FINITE RESOURCES



Question of how best to divide those resources.

The concept of OPPORTUNITY COST; the benefits foregone from not choosing the next best alternative

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# Why do an economic evaluation

- Who
  - ...are we doing the evaluation for? (PERSPECTIVE)
- What
  - ... is the benchmark for the decision being made? (THRESHOLD)
  - ... are the comparators? (INTERVENTIONS & SCENARIOS)
- Where
  - ... are the interventions being implemented? (SETTING)
  - .... are the impacts occurring? (POPULATION)
- When
  - ... is this all occurring? (DISCOUNTING)

# What is economic evaluation?

Cost-benefit analysis (CBA)

Monetary valuation of outcomes

Cost-effectiveness analysis (CEA)

Natural unit of outcome e.g. change in mortality

Cost-minimisation analysis (CMA)

Outcomes are equivalent

Cost-utility analysis (CUA)

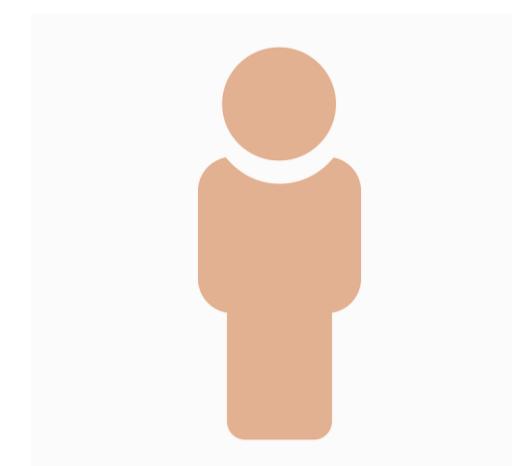
QALYs or DALYs used to measure / value outcomes (Quality / Disability-Adjusted Life-Years)

$$\text{ICER} = \frac{\text{mean cost B} - \text{mean cost A}}{\text{mean effect B} - \text{mean effect A}}$$

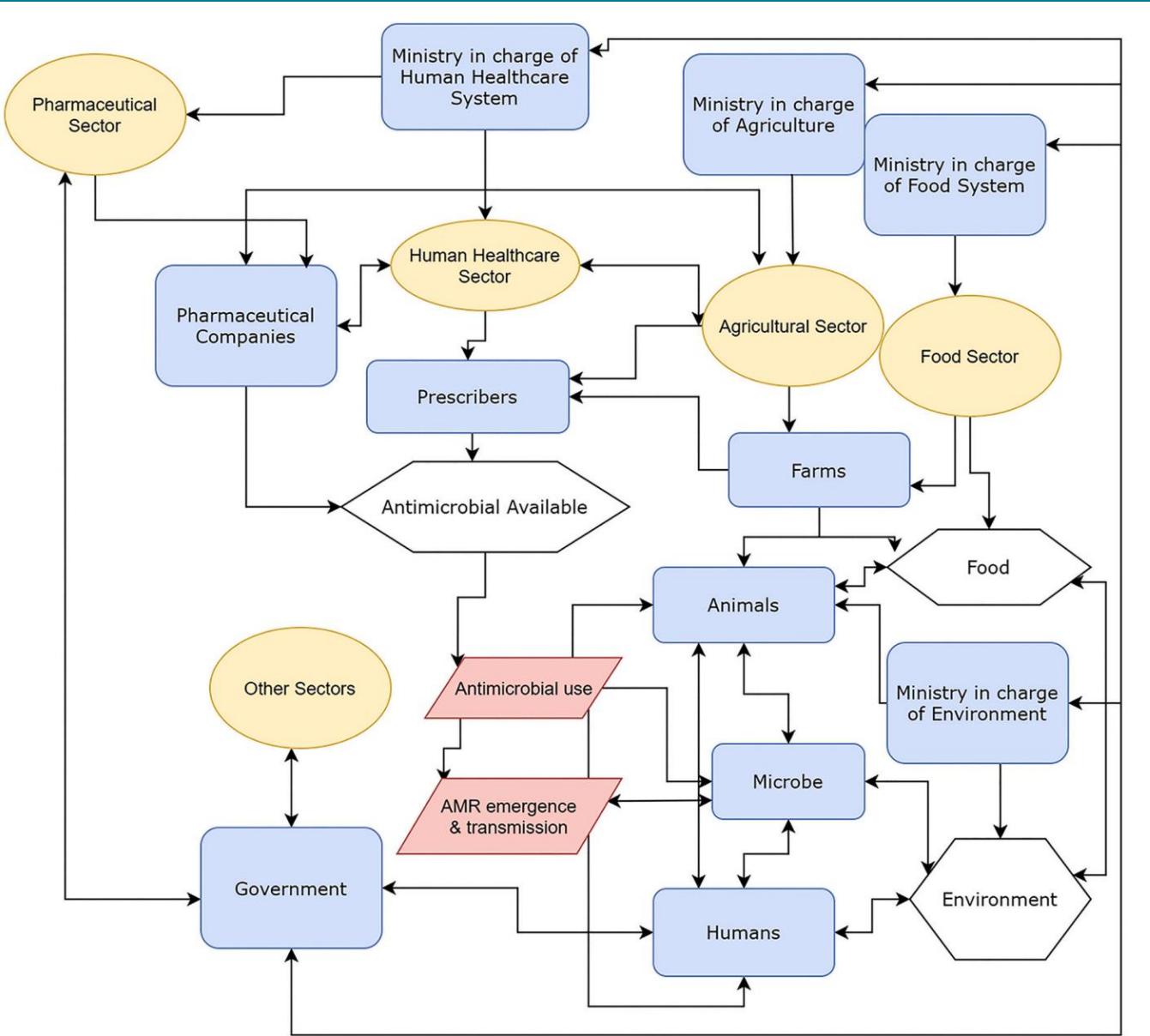
< THRESHOLD

# The Patient

- Trade-off between access and excess
- Access now to the “finite resource of antibiotics” ...
- Valuation of treating patients now vs later



# The System made up of Stakeholders, Sectors and Resources



Naylor, N.R., Lines, J., Waage, J., Wieland, B. and Knight, G.M., 2020. Quantitatively evaluating the cross-sectoral and One Health impact of interventions: A scoping review and case study of antimicrobial resistance. *One Health*, 11, p.100194.

# Matching these stakeholders to objectives and outcomes

Stakeholder	Objective Function Factor	Measurable Outcome in Economic Evaluation
Individuals (patient, the public)	<ul style="list-style-type: none"> <li>Net income</li> <li>Utility</li> </ul>	<ul style="list-style-type: none"> <li>Employment rates</li> <li>Per capita net income</li> <li>Mortality</li> <li>Utility (e.g. QALY)</li> </ul>
Firms (farm, pharmaceutical company)	<ul style="list-style-type: none"> <li>Income</li> <li>Revenue</li> <li>Profit</li> <li>Risk</li> </ul>	<ul style="list-style-type: none"> <li>Firm income, costs, profit</li> <li>Firm productivity</li> <li>Cost-benefit</li> </ul>
Sector -Healthcare System	<ul style="list-style-type: none"> <li>Cost</li> <li>Mortality</li> <li>Morbidity/Utility</li> <li>Budget</li> </ul>	<ul style="list-style-type: none"> <li>Mortality rates and/or case fatality rates</li> <li>Infection epidemiology</li> <li>Cost-effectiveness</li> <li>Cost-utility</li> <li>Budget-impact</li> </ul>
Sector – Agricultural and Food System	<ul style="list-style-type: none"> <li>Cost</li> <li>Sector productivity</li> <li>Budget</li> <li>Nutrition</li> </ul>	<ul style="list-style-type: none"> <li>Cost-benefit</li> <li>Productivity</li> <li>Mortality rates Infection epidemiology</li> <li>Cost-utility related to malnutrition</li> </ul>
Sector – Environmental System	<ul style="list-style-type: none"> <li>Resource availability</li> <li>Pollution</li> <li>Biodiversity</li> </ul>	<ul style="list-style-type: none"> <li>Environmental impact/pollution (e.g. through residues or resistant microbes)</li> </ul>
Government	<ul style="list-style-type: none"> <li>National productivity and accounts</li> <li>Population utility</li> <li>Cost-benefit</li> <li>Equity</li> <li>Risk</li> </ul>	<ul style="list-style-type: none"> <li>Gross Domestic Product</li> <li>Population Mortality &amp; morbidity</li> <li>Infection epidemiology</li> <li>Environmental resource</li> </ul>

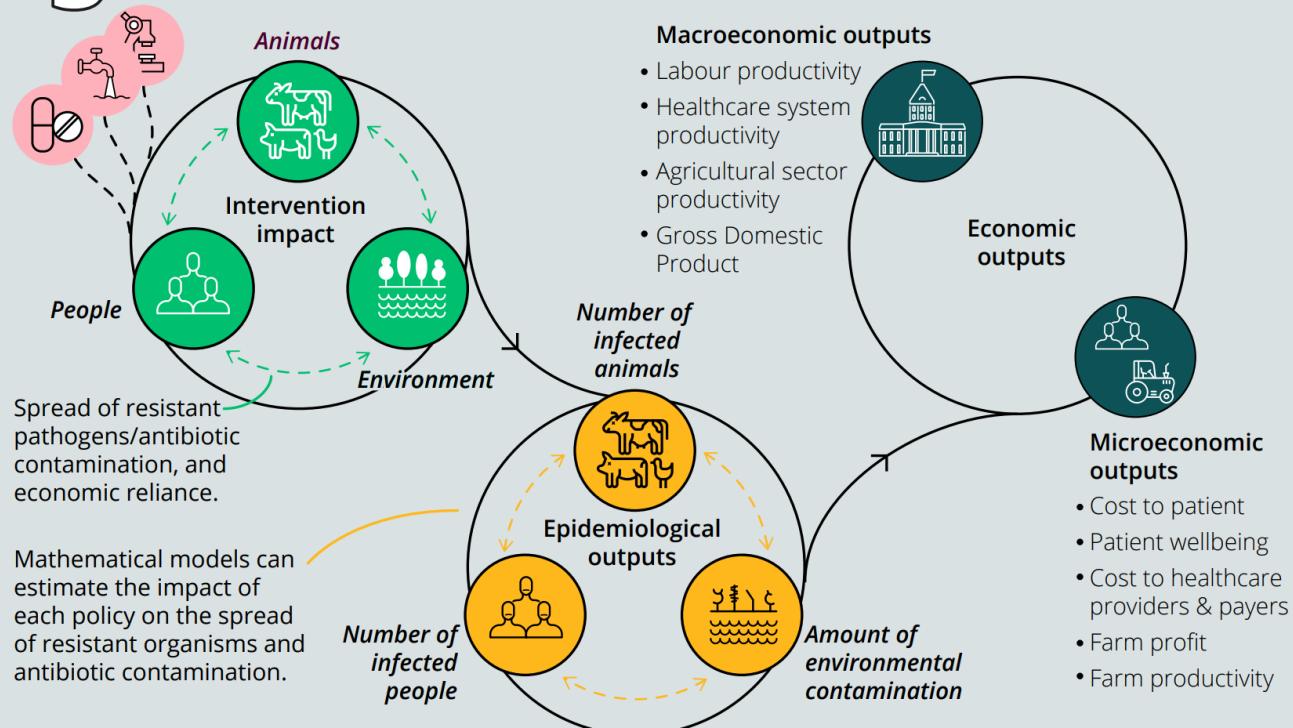
## 1 Consider the intervention options

-  Eliminate use of antibiotics for promoting growth of animals
-  Rapid and accurate diagnostics for drug-resistant infections in hospital
-  Improved sanitation and hygiene on farms

## 2 Consider the stakeholders and their objectives



## 3 Model the impact of intervention options on stakeholder objectives over time



### Model outputs\*



	100,000	150,000	250,000
Number of infected people	100,000	150,000	250,000
Number of infected animals	600	700	800
Environmental contamination (mg/kg soil)	0.43	0.58	0.40
Population wellbeing (measured through quality-adjusted life years)	9800	10600	9000
Agriculture sector productivity (\$m)	\$1.2m	\$1.4m	\$1.1m
Gross Domestic Product (GDP)(\$bn)	\$8.7bn	\$10bn	\$9.2bn

A weighted average is calculated according to the specified importance of each output and used to rank the policy options.



jpiamr

\*Numbers are for example purposes only, this figure is not a depiction of real data

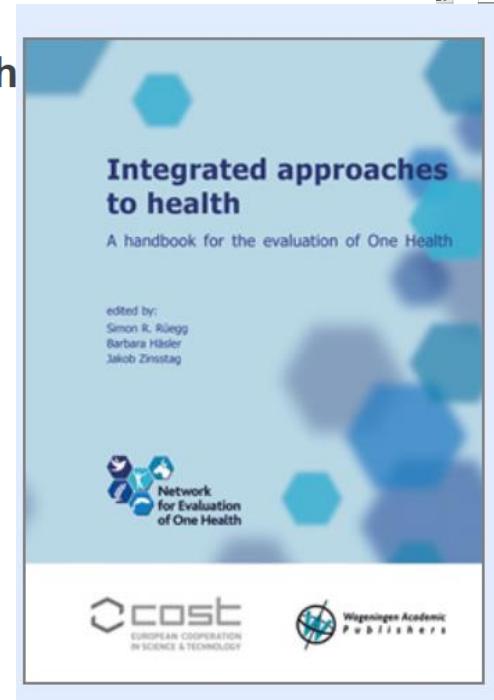
## Tools available



# World Health Organization



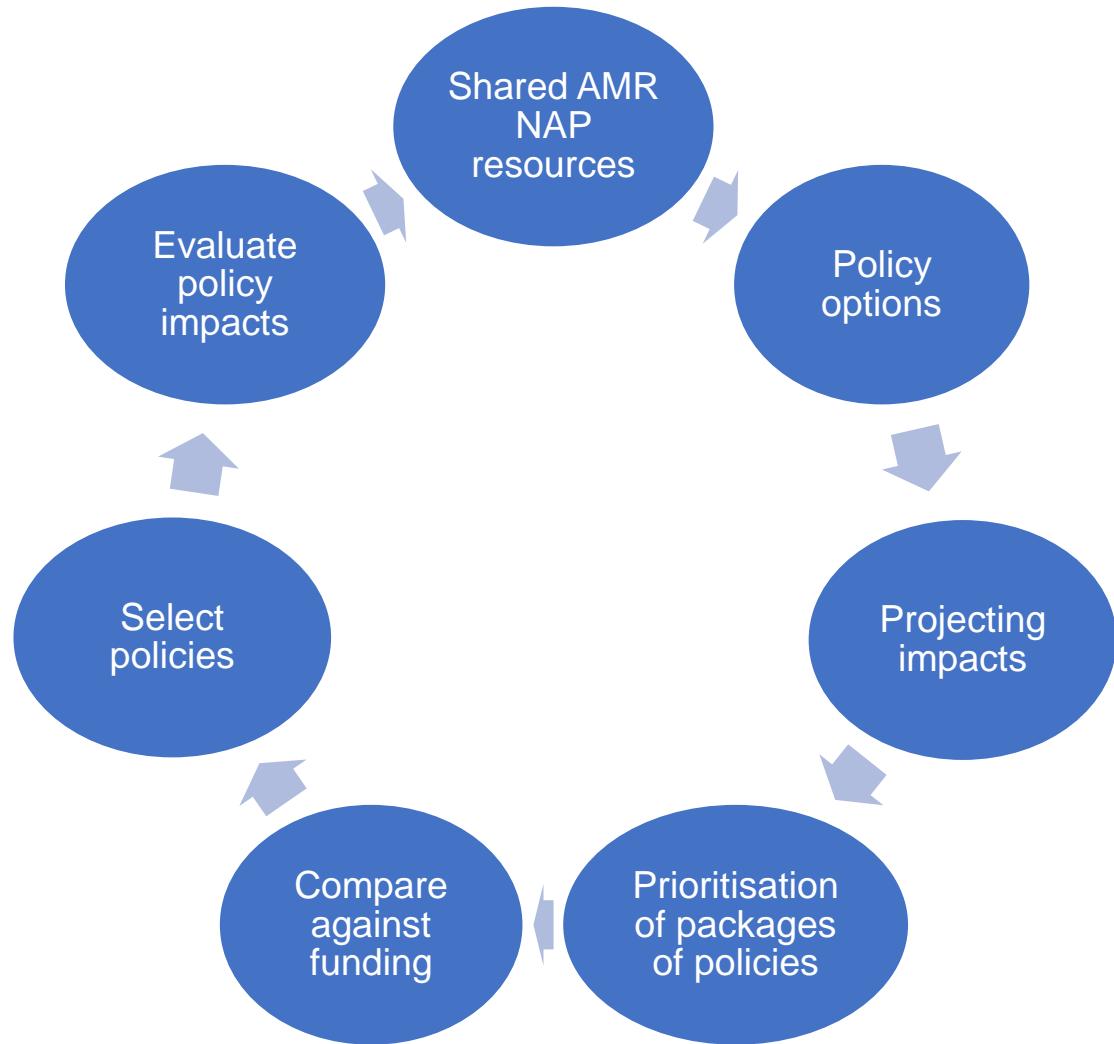
[Home](#) / [Tools and toolkits](#) / OneHealth



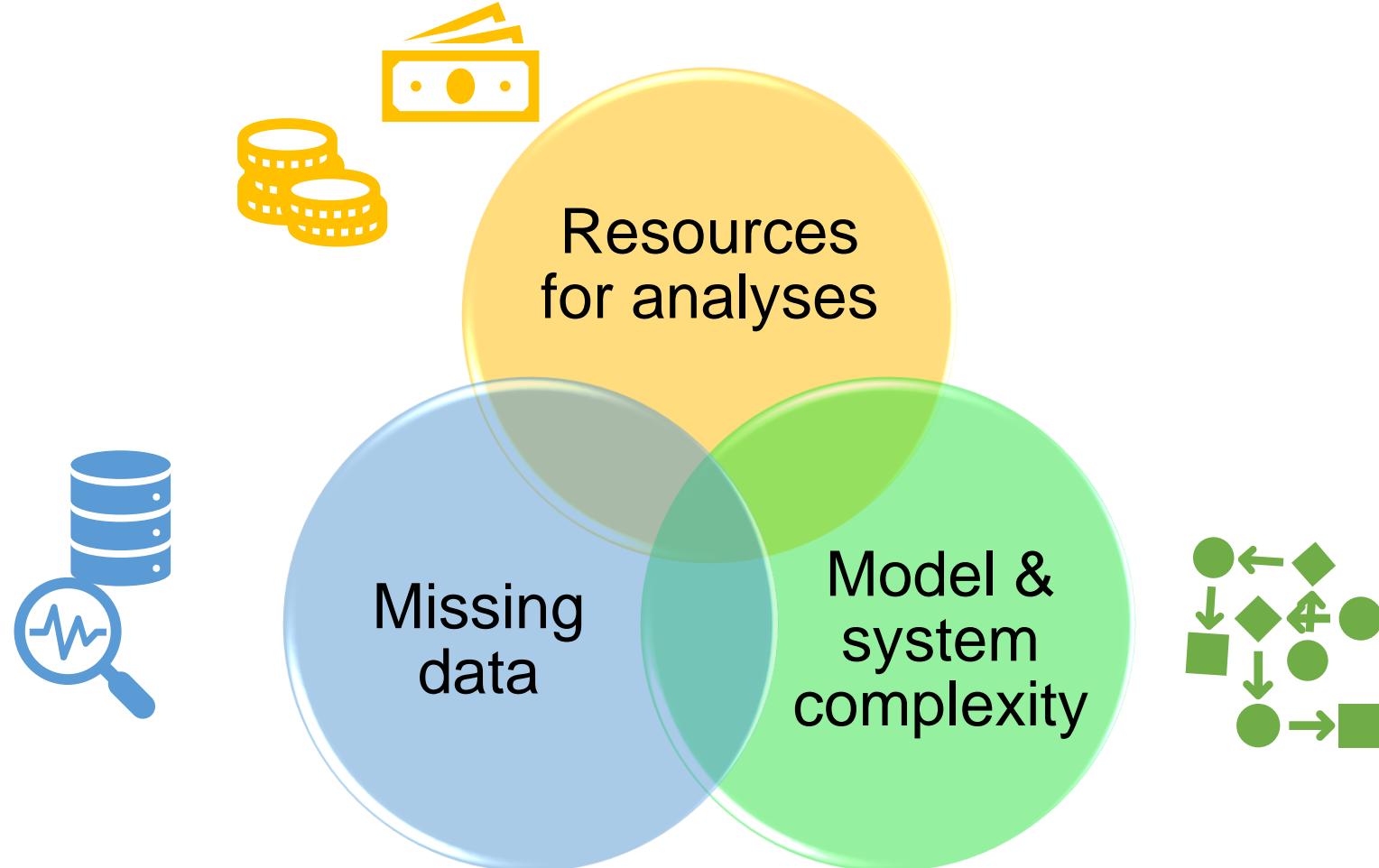
# **WHO Costing and Budgeting Tool for National Action Plans on Antimicrobial Resistance**

## User guide

# Where does this fit into the AMR policy process?

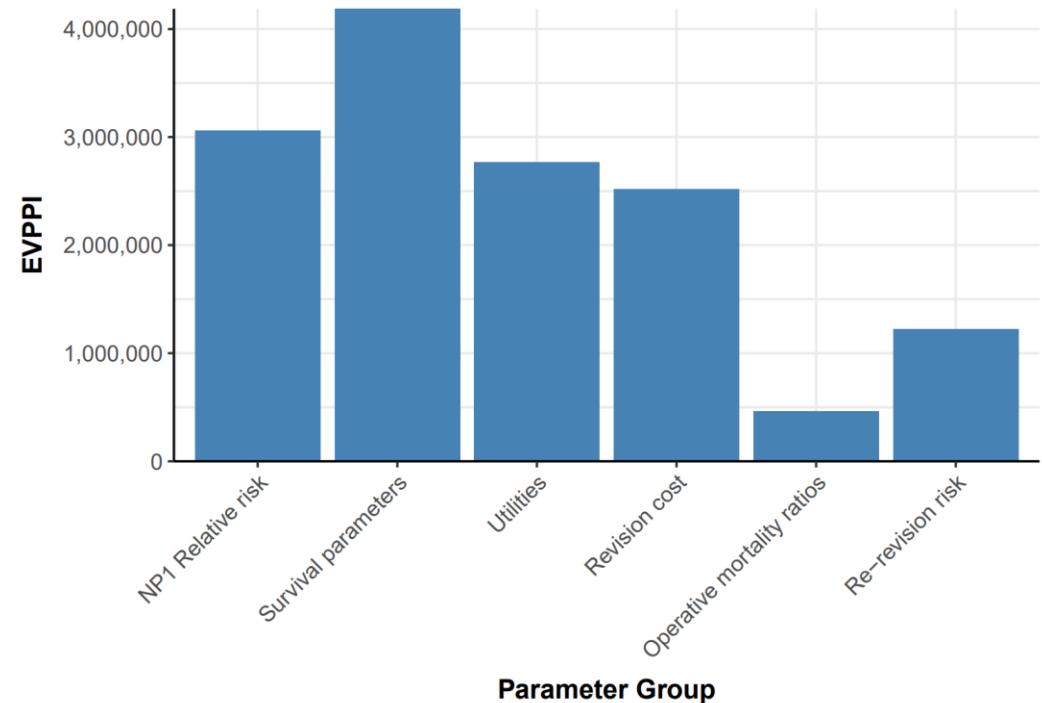


# Key Potential Challenges



# Priority Investments into Economic Analyses – Funding for analyses

- Aids efficient resource allocation
- Can help guide where to invest in the future for more information through Sensitivity Analysis and Value of Information Analysis
- ... need to build the foundational economic models first



[LSHTM-GHECO/DM4HEE RCode: Decision Modelling for Health Economic Evaluation R Code \(github.com\)](#)

# Priority Investments into Economic Analyses - Models

- Start building subsections and connecting inputs/outputs
- Set up economic evaluation model frameworks in a way where models can be tailored to future needs
- Share models:



The health and cost burden of antibiotic resistant and susceptible *Escherichia coli* bacteraemia in the English hospital setting: A national retrospective cohort study

14

Nichola R. Naylor<sup>1\*</sup>, Koen B. Pouwels<sup>2,3a</sup>, Russell Hope<sup>4</sup>, Nathan Green<sup>5</sup>, Katherine L. Henderson<sup>4</sup>, Gwenan M. Knight<sup>1</sup>, Rifat Atun<sup>1,6</sup>, Julie V. Robotham<sup>1,2c</sup>, Sarah R. Deeny<sup>7c</sup>

Economic & Epidemiological Evaluations Related to  
Antimicrobial Resistance  
[https://zenodo.org/communities/amr\\_evaluation/?page=1&size=20](https://zenodo.org/communities/amr_evaluation/?page=1&size=20)



**Code-Sharing in Cost-of-Illness Calculations: An Application to Antibiotic-Resistant Bloodstream Infections**

Nichola R. Naylor<sup>1††</sup>, Kazuto Yamashita<sup>2†</sup>, Michiyo Iwami<sup>1,3</sup>, Susumu Kunisawa<sup>2</sup>, Seiko Mizuno<sup>2</sup>, Enrique Castro-Sánchez<sup>1,4</sup>, Yuichi Imanaka<sup>2</sup>, Raheerah Ahmad<sup>1,5</sup> and Alison Holmes<sup>1,6</sup>

# Priority Investments into Economic Analyses - Parameters

Unit cost estimates are useful in being able to show the value of AMR-sensitive interventions (e.g. Vaccines & WASH); e.g. “AMR-UCR” for human health impact costs

Utilise experience from COVID-19 - how we can harness secondary data, how it can be used for health outcome evaluation - can we build in economics to this also ?

Expert elicitation techniques

Incorporate parameter uncertainty into analyses

# Conclusions

Economic evaluation is about **maximising desired outcomes** that matter across the whole system from all stakeholders; **from patient to policy maker**

**Open communication** of needs from policy makers and **open access** of data & models used will help strengthen our ability to tackle AMR in the future