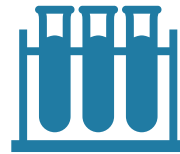


# Impact & Value of Diagnostics: a Health Economics' perspective



## Consider a patient consulting a GP with signs of a respiratory infection



€4.07

C-reactive protein test



€0.69

Amoxicillin 500mg 3d

# OBJECTIVES OF VALUE-Dx

Helping to build the economic case for rapid diagnostics as a public good in the fight against AMR

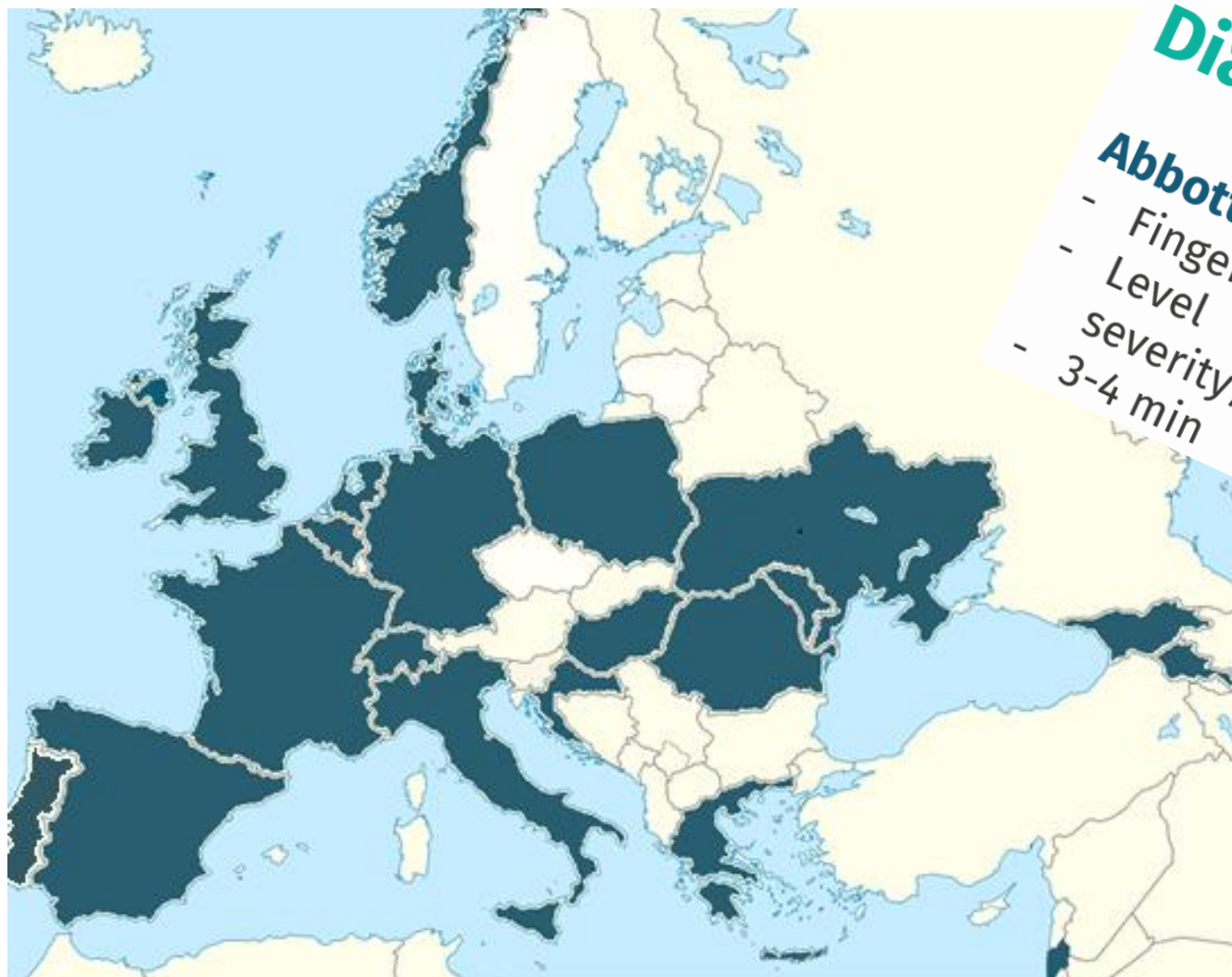
1. To **design a health-economic framework (HEF)** to assess and demonstrate the value of diagnostics both for individual patients and for public health impact by reducing antibiotic use and subsequent antibiotic resistance among patients.

2. To **establish a sustainable European Standardised Care Network** adequately trained and resourced to conduct clinical trials evaluating the value of diagnostics.

3. To **design and implement clinical studies to demonstrate the value of diagnostics** in the optimal management of Community-Acquired Acute Respiratory Tract Infections (CA-ARTIs).

4. To **explore, define and attempt to resolve the psychological, ethical and social barriers** which prevent the more widespread adoption of diagnostics delivering healthcare to the population.

# COVERAGE OF VALUE-Dx



## Diagnostic intervention PRUDENCE

### Abbott: CRP POC test

- Finger prick blood
- Level of C-reactive protein, measure for disease
- severity/prognosis
- 3-4 min

protein, measure for disease

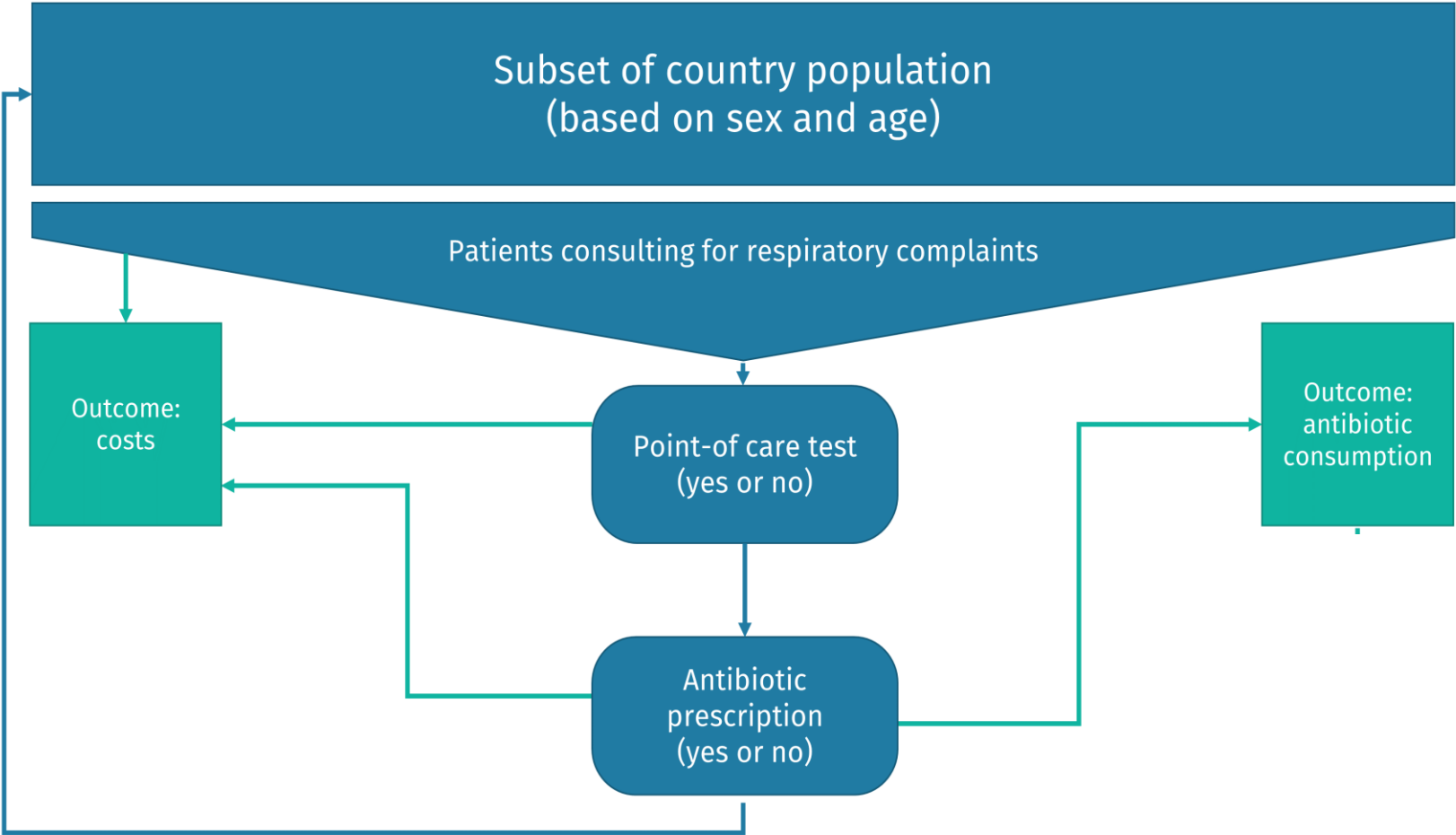
# Model Structure: applied to EU-countries

## Data sources

Demographic data

ARI/ILI consultation data

Point-prevalence audit survey VALUE-Dx





# Comparing two Strategies: illustrative results



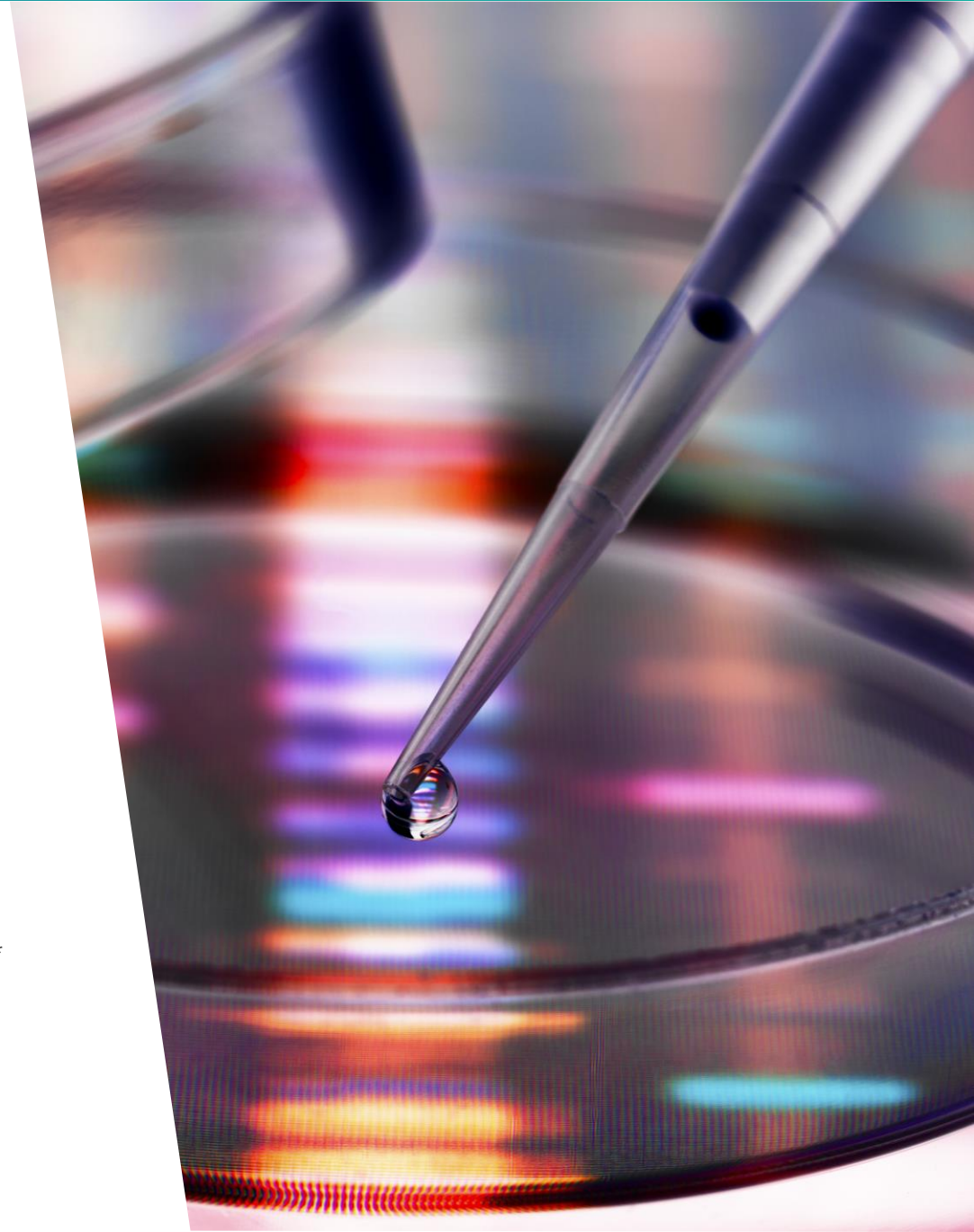
## Current standard of care for first-line community-acquired respiratory tract infections

Including country-specific test use  
and antibiotic prescriptions

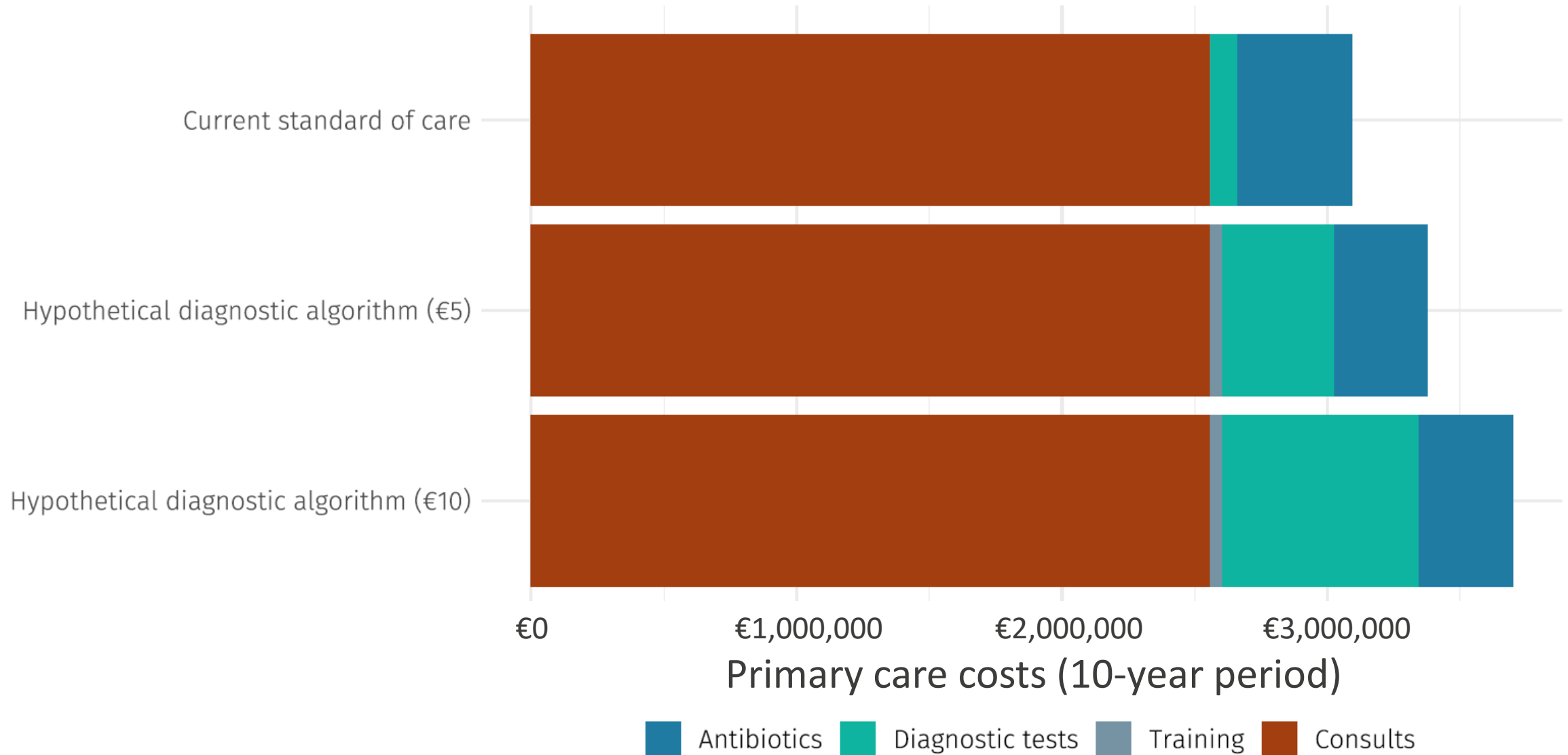


## Large-scale point-of-care testing strategy

Effective at reducing antibiotic prescribing with 21%\*  
for a specifically defined patient group  
At two price-points: €5 and €10



# Primary Care Costs: 10,000 patients eligible for CRP



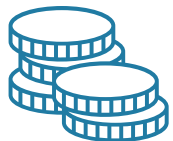
# Full Story



On the long run, AMR is avoided  
**Barrier:** short-term view



Gains in quality of life, ideally  
expressed in Quality-Adjusted Life  
Years (QALYs)  
**Barrier:** complexity of measuring



Cost savings in other sectors in  
health care (hospitals, labs...)  
**Barrier:** no integral view of health  
care





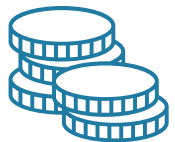
# Full Story



On the long run, AMR is avoided  
**Barrier: short-term view**



Gains in quality of life, ideally  
expressed in Quality-Adjusted Life  
Years (QALYs)  
**Barrier: complexity of measuring**



Cost savings in other sectors in  
health care (hospitals, labs...)  
**Barrier: no integral view of health  
care**



# Long-term: AMR forecasting module

Pharmacoeconomics (2022) 40:823–833  
<https://doi.org/10.1007/s40273-022-01165-3>

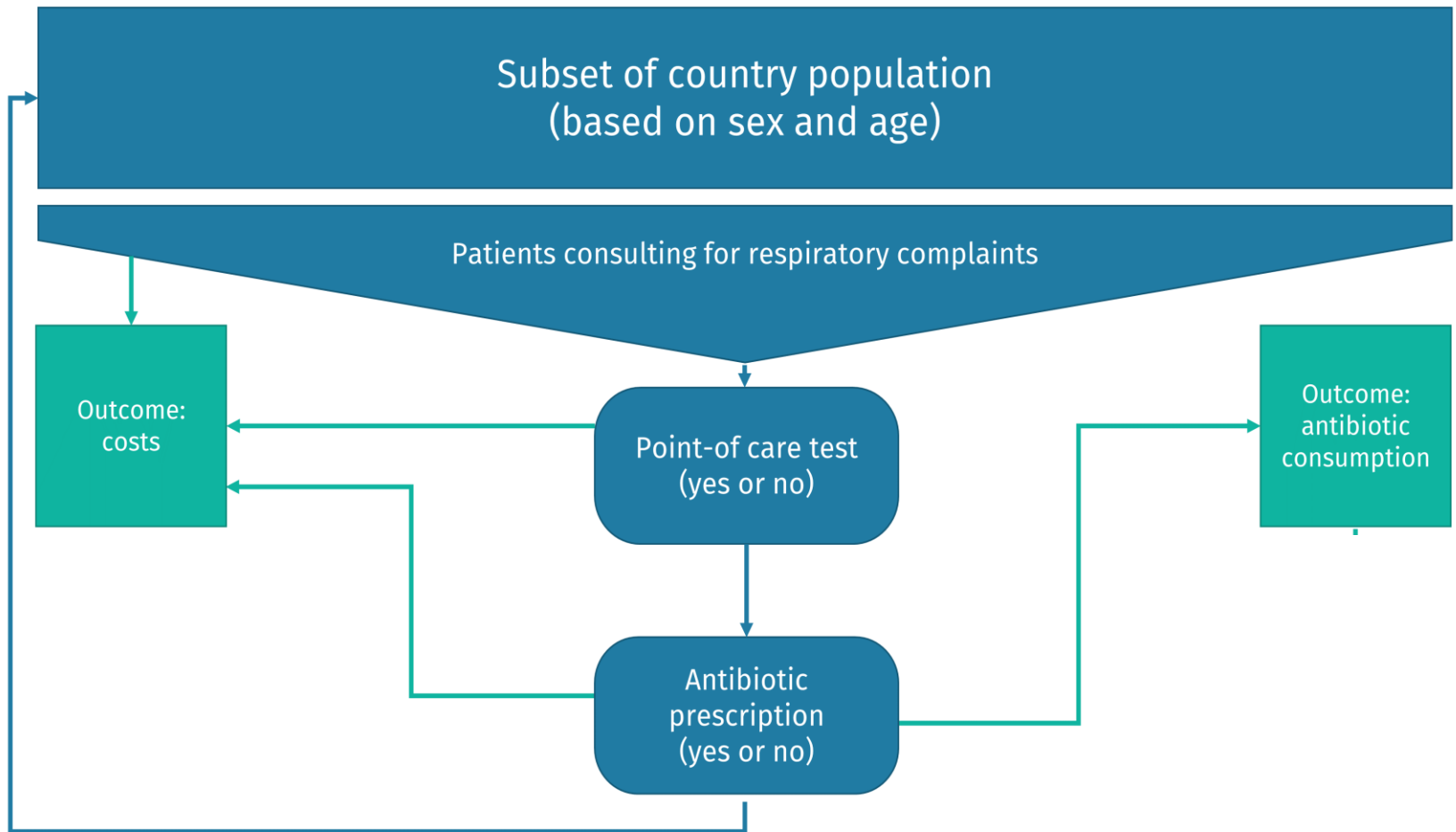
ORIGINAL RESEARCH ARTICLE



## The Opportunity of Point-of-Care Diagnostics in General Practice: Modelling the Effects on Antimicrobial Resistance

Simon van der Pol<sup>1,2</sup> · Danielle E. M. C. Jansen<sup>3,4</sup> · Alike W. van der Velden<sup>5</sup> · Christopher C. Butler<sup>6</sup> · Theo J. M. Verheij<sup>5</sup> · Alex W. Friedrich<sup>7,8</sup> · Maarten J. Postma<sup>1,2,9</sup> · Antoinette D. I. van Asselt<sup>1,10</sup>

# Long-term analysis



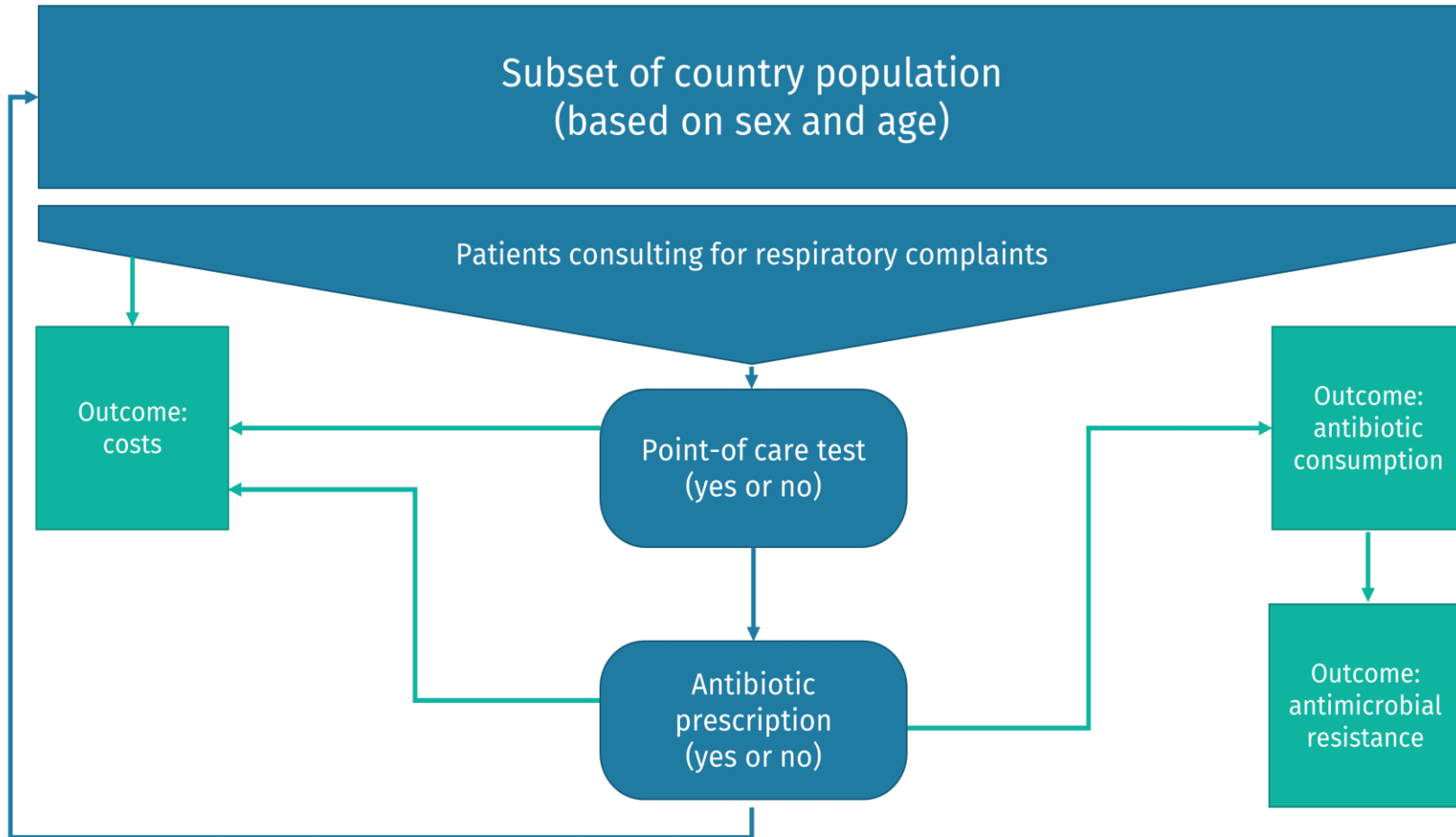
## Sources

Demographic data

ARI/ILI consultation data

Point-prevalence audit survey

# Long-term analysis



## Data sources

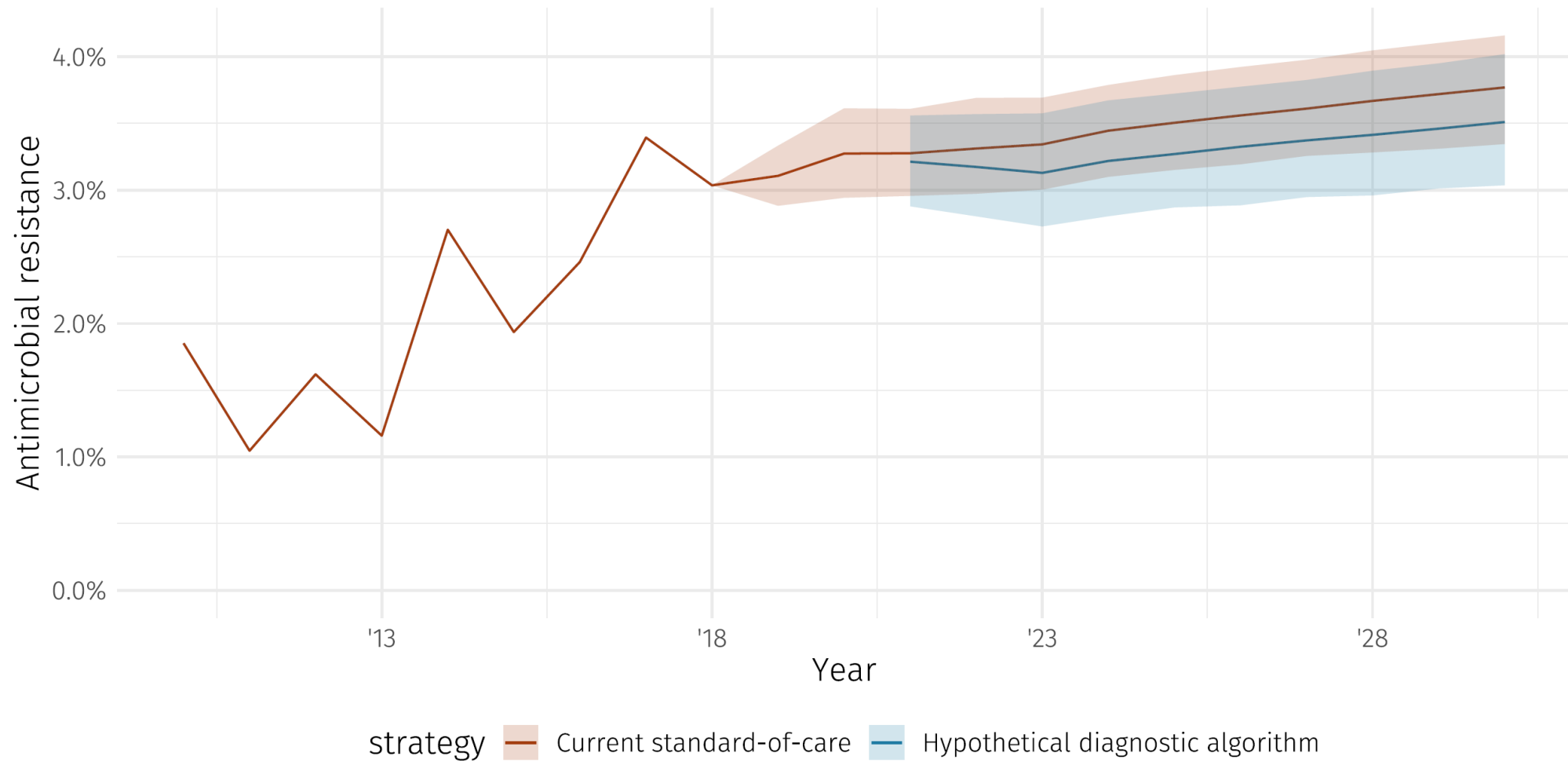
Demographic data

ARI/ILI consultation data

Point-prevalence audit survey

AMR forecasting model  
(in cooperation with  
OECD; ECDC data)

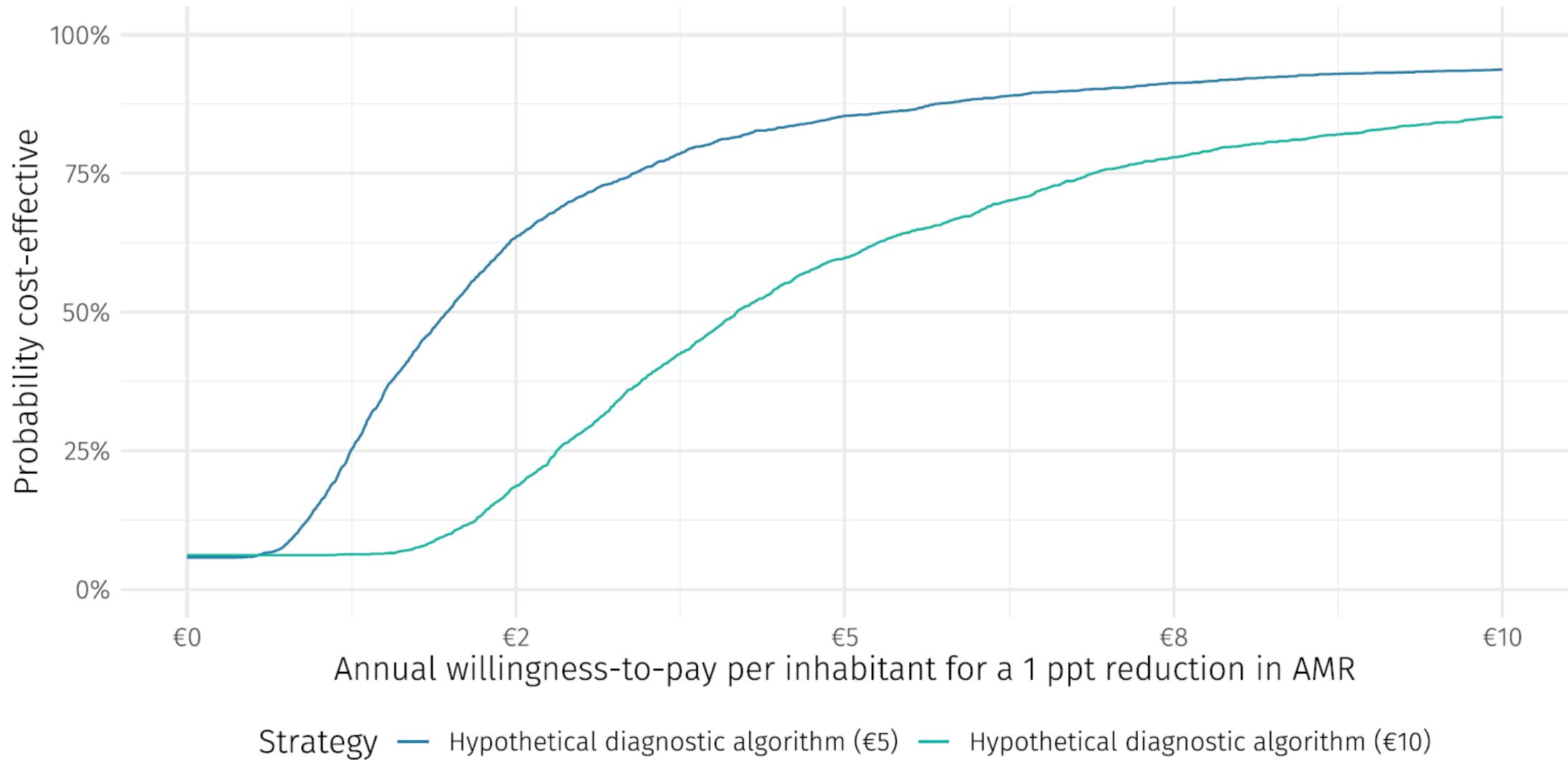
# Antimicrobial resistance



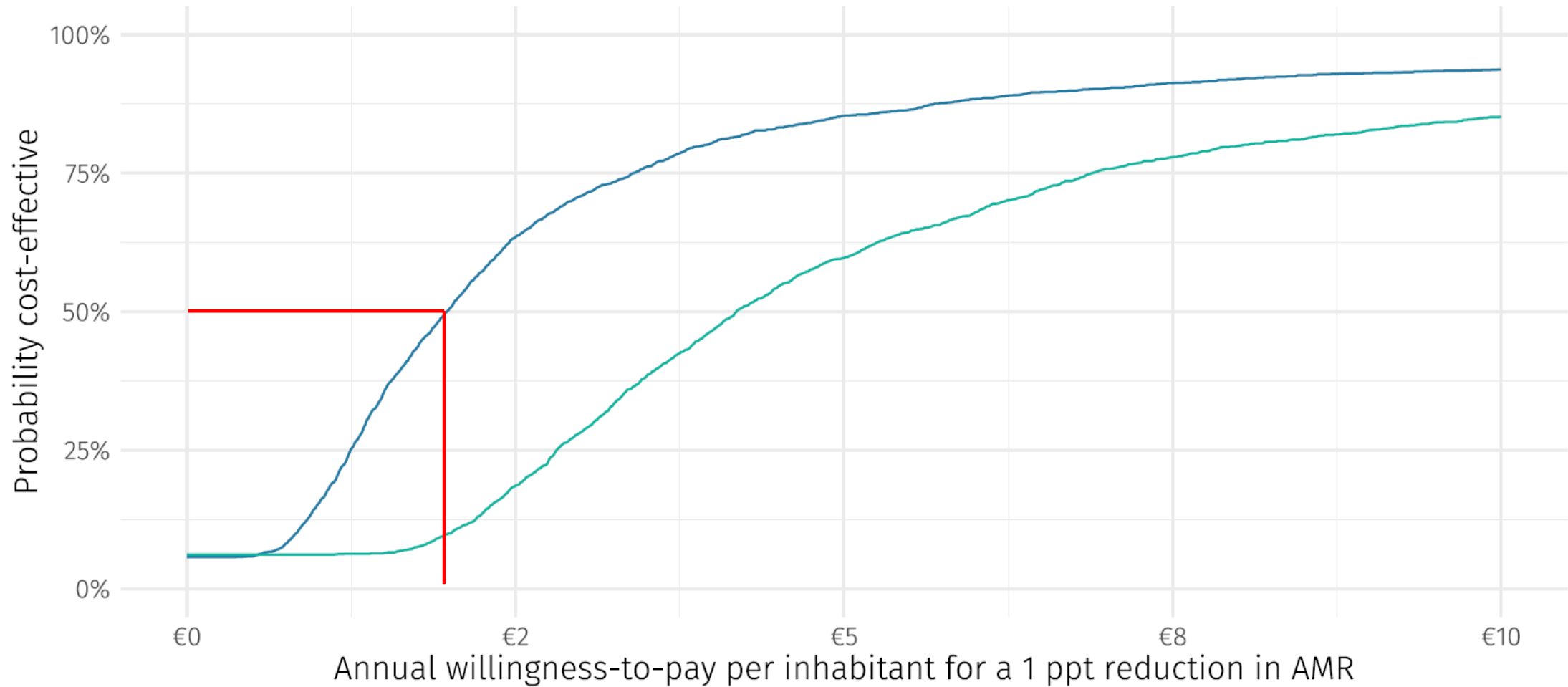
Resistance of *Streptococcus pneumoniae* to broad spectrum penicillins in the Netherlands



# Willingness to pay for AMR reduction (e.g., 4% to 3%)

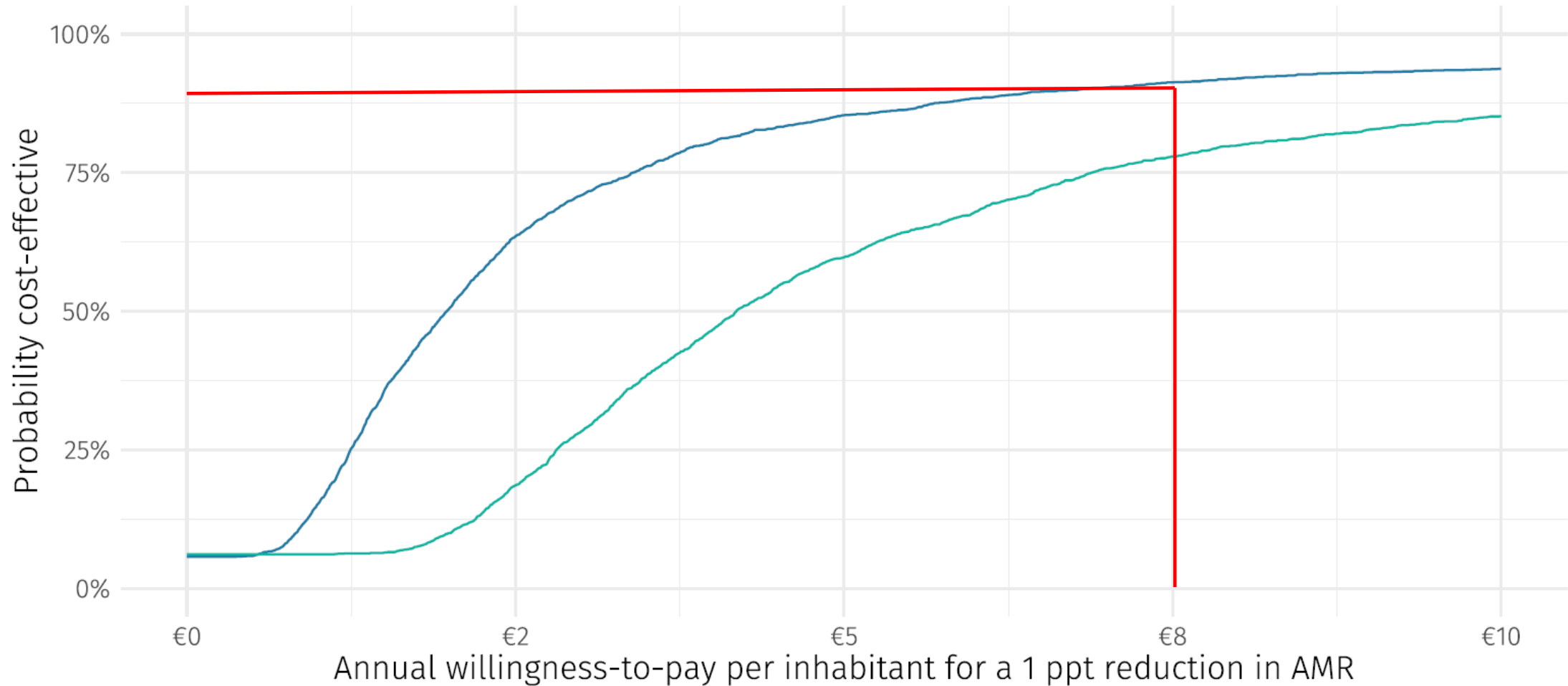


# Willingness to pay for AMR reduction



Strategy — Hypothetical diagnostic algorithm (€5) — Hypothetical diagnostic algorithm (€10)

# Willingness to pay for AMR reductions



Strategy — Hypothetical diagnostic algorithm (€5) — Hypothetical diagnostic algorithm (€10)

# Full Story

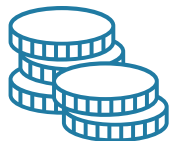


On the long run, AMR is avoided  
Barrier: short-term view



Gains in quality of life, ideally  
expressed in Quality-Adjusted Life  
Years (QALYs)

**Barrier: complexity of measuring**



Cost savings in other sectors in  
health care (hospitals, labs...)  
Barrier: no integral view of health  
care



# Research

Raymond Oppong, Mark Jit, Richard D Smith, Christopher C Butler, Hasse Melbye, Sigvard Mölsted and Joanna Coast

## Cost-effectiveness of point-of-care C-reactive protein testing to inform antibiotic prescribing decisions

### Cost-effectiveness

Once patient characteristics at first clinic visit are accounted for, the regression model predicts that use of POCCRP increases healthcare costs by €11.27 ( $P = 0.09$ ) and reduces the probability of antibiotic prescribing by 10% ( $P = 0.08$ ) per patient. This suggests that an additional cost per patient prescription avoided as a result of POCCRP is €112.70. POCCRP is also associated with a cost per QALY

gain of €9391. At €30 000 per QALY, the incremental net monetary benefit was €25.20. Figure 1 shows the incremental net monetary benefit at different willingness-to-pay thresholds. At a willingness-to-pay threshold of €30 000 per QALY, the probability of POCCRP being cost-effective is approximately 70% (Figure 2).

QALY = Quality Adjusted Life Years

One QALY equates to one year in perfect health



# Research

Raymond Oppong, Mark Jit, Richard D Smith, Christopher C Butler, Hasse Melbye, Sigvard Mölsted and Joanna Coast

## Cost-effectiveness of point-of-care C-reactive protein testing to inform antibiotic prescribing decisions

### Cost-effectiveness

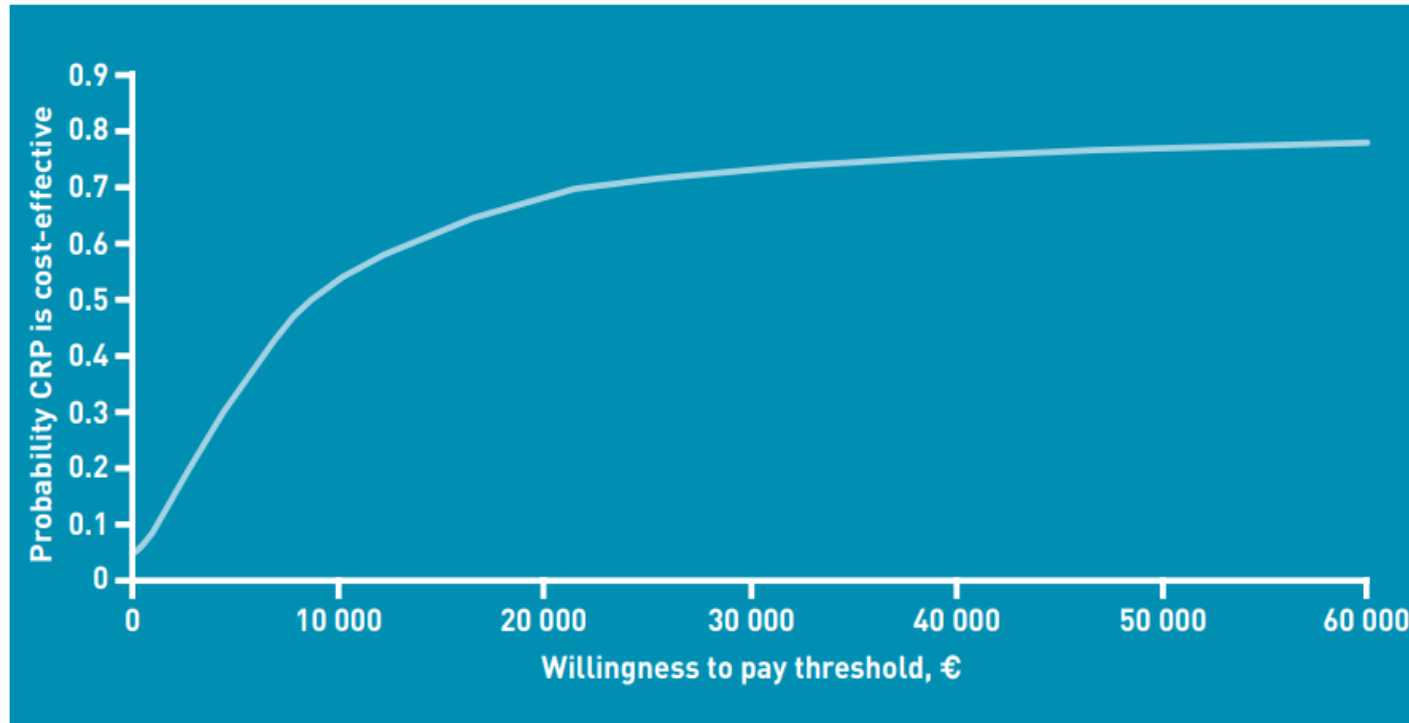
Once patient characteristics at first clinic visit are accounted for, the regression model predicts that use of POCCRP increases healthcare costs by €11.27 ( $P = 0.09$ ) and reduces the probability of antibiotic prescribing by 10% ( $P = 0.08$ ) per patient. This suggests that an additional cost per patient prescription avoided as a result of POCCRP is €112.70. POCCRP is also associated with a cost per QALY

gain of €9391. At €30 000 per QALY, the incremental net monetary benefit was €25.20. Figure 1 shows the incremental net monetary benefit at different willingness-to pay thresholds. At a willingness-to pay threshold of €30 000 per QALY, the probability of POCCRP being cost-effective is approximately 70% (Figure 2).

QALY = Quality Adjusted Life Years

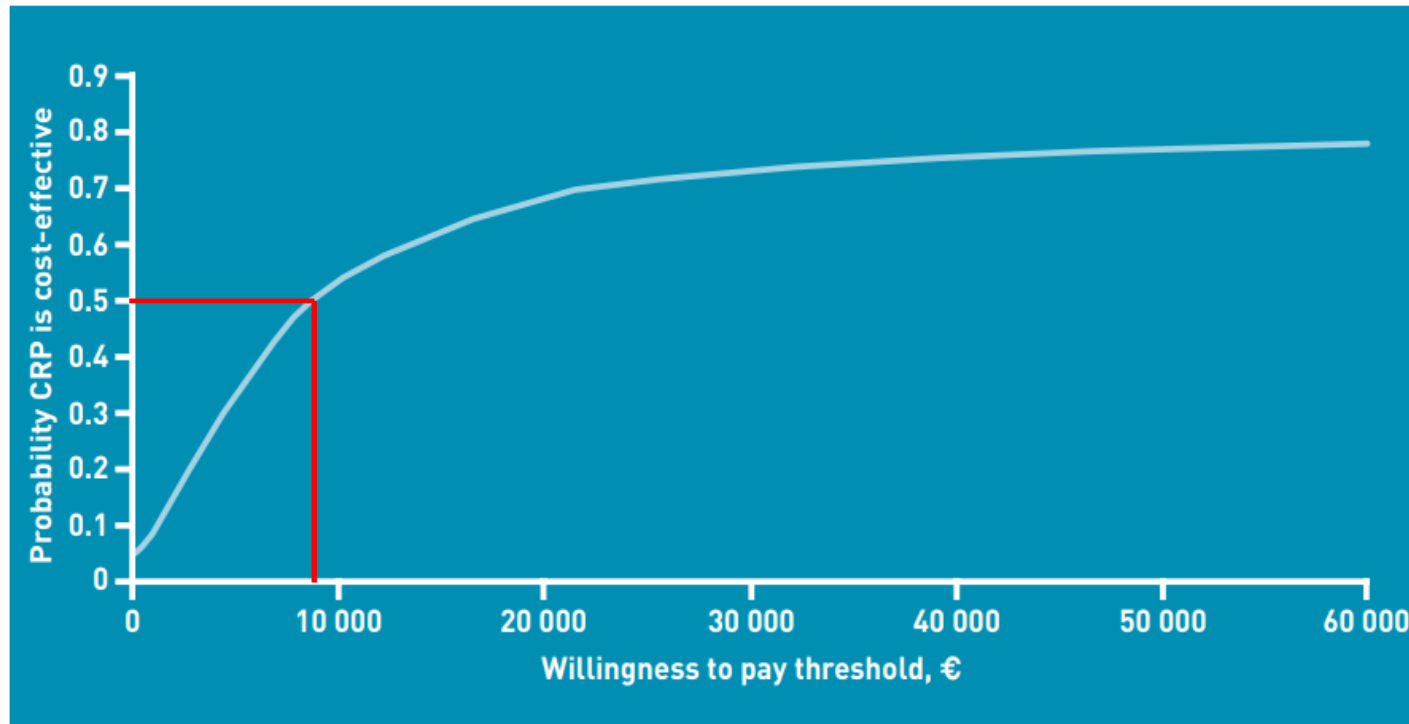
One QALY equates to one year in perfect health

# Short-term: extra costs, savings & QALY gains



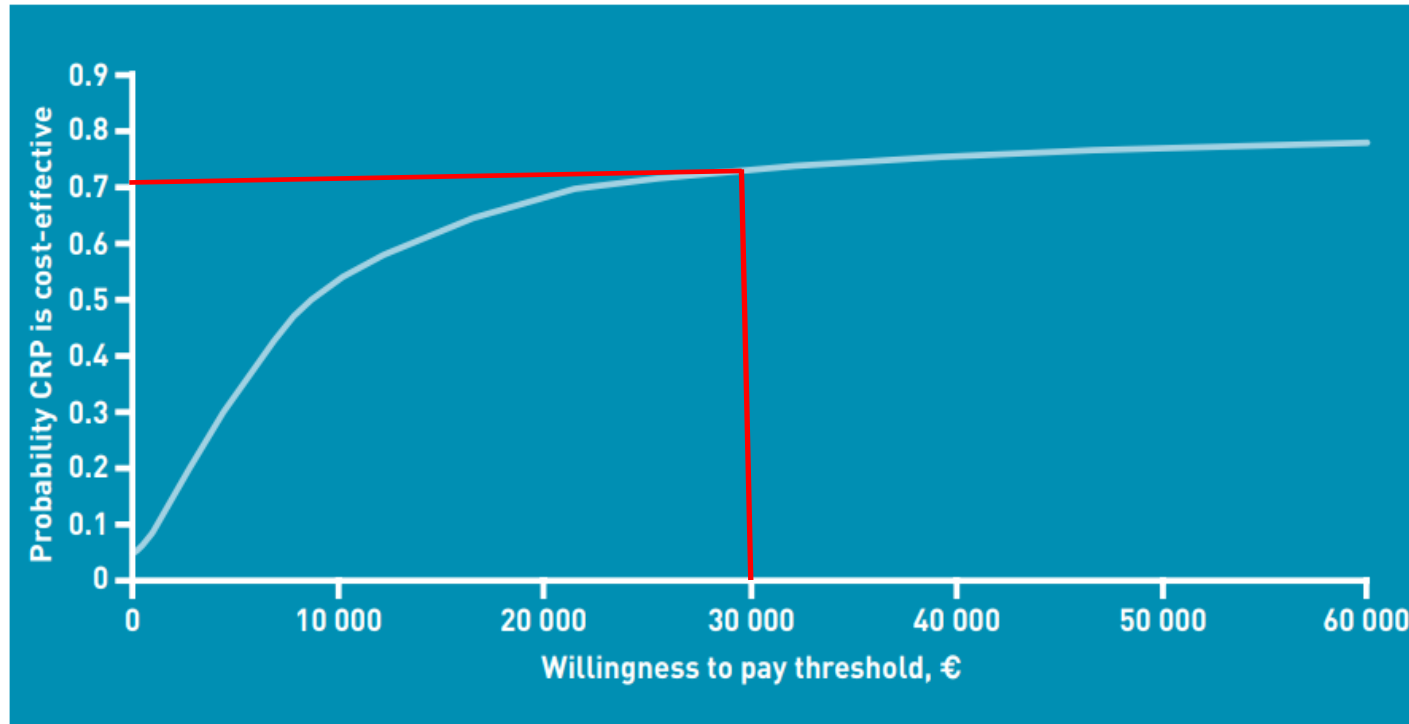
*Figure 2. Cost-effectiveness acceptability curve.  
CRP = C-reactive protein.*

# Short-term: extra costs & QALY gains



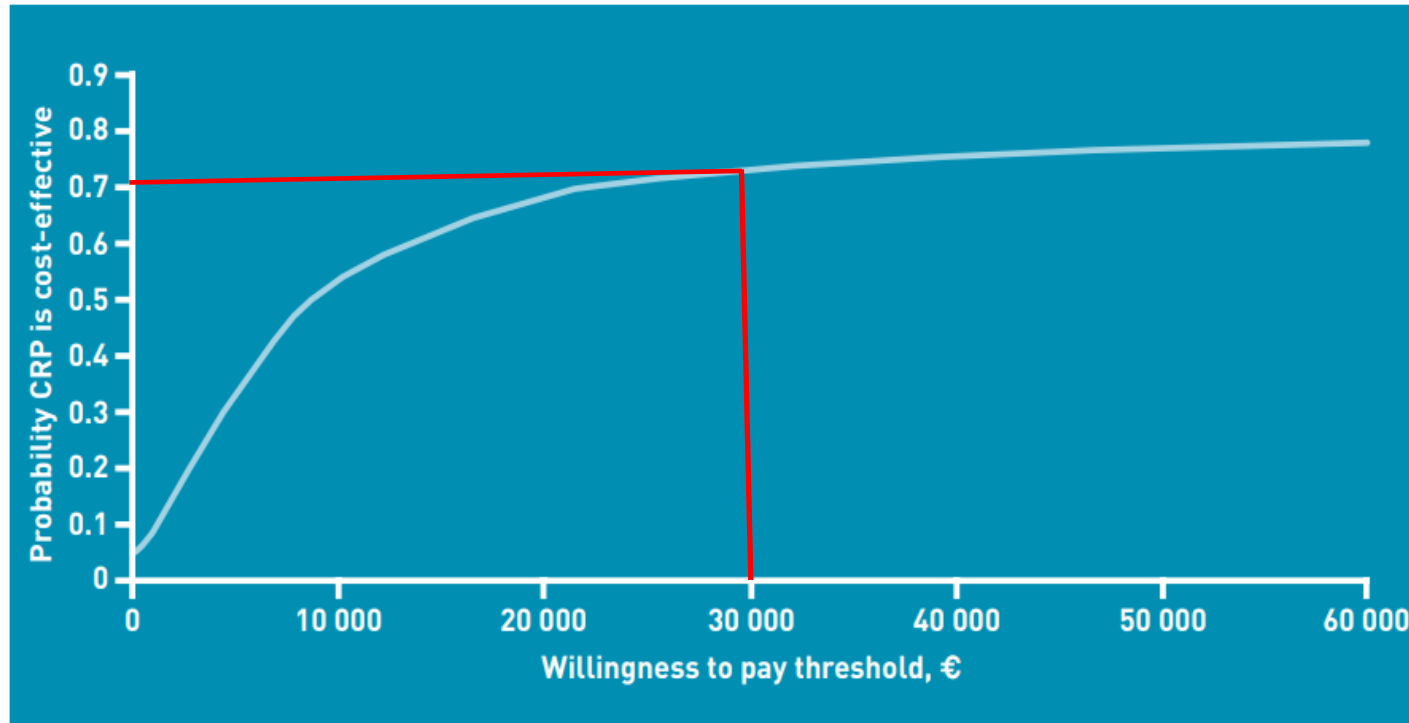
*Figure 2. Cost-effectiveness acceptability curve.  
CRP = C-reactive protein.*

# Short-term: extra costs, savings & QALY gains



*Figure 2. Cost-effectiveness acceptability curve.  
CRP = C-reactive protein.*

# Short-term: extra costs, savings & QALY gains



Short-term QALY-gains:

Reduced side effects  
corresponding to reduced unjust  
Abx prescribing

Better outcomes with increased  
just Abx prescribing

Increased satisfaction in  
treatment due to sheer knowing  
test result

*Figure 2. Cost-effectiveness acceptability curve.  
CRP = C-reactive protein.*



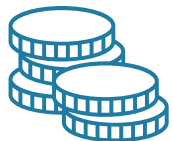
# Full Story



On the long run, AMR is avoided  
Barrier: short-term view



Gains in quality of life, ideally  
expressed in Quality-Adjusted Life  
Years (QALYs)  
Barrier: complexity of measuring



Cost savings in other sectors in  
health care (hospitals, labs...)  
**Barrier: no integral view of health  
care**



## AIMS

- Document the current RTI pathways for CRP testing in 4 countries
  - High uptake: Netherlands and Norway
  - Low uptake: England and Italy
- Explore how patient pathways change with the implementation of a rapid CRP POC test.

## OUTPUTS

- Detailed, **micro-costed pathways** (based on clinician interviews, clinical guidelines and published literature) showing average pathway cost per patient, antibiotic prescriptions and hospital referrals.
- Planned: A **peer-reviewed paper** demonstrating the impact of implementing CRP POC testing in low- and high-uptake countries (costs: 4 € per test)

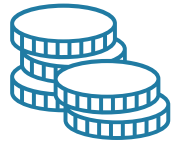
## Hypothetical implementation of CRP POCT to manage RTIs in adult in primary care in UK and Italy.

	Standard of care RTI pathway without CRP POC test			Hypothetical RTI pathway with CRP POC test			Difference (CRP POC vs. SOC)		
	Cost per patient (£)	% with antibiotic prescription	% with hospital referral	Cost per patient (£)	% with antibiotic prescription	% with hospital referral	Reduction in cost per patient (%)	Reduction in Abx (%)	Reduction in hospital referrals (%)
<b>UK</b> (n=2116)	£35.16	43.2%	2.53%	£34.44	36.7%	1.96%	↓ 2%	↓ 15%	↓ 23%
<b>Italy</b> (n=1204)	€33.64	51.5%	3.79%	€29.87	38.0%	2.99%	↓ 11%	↓ 26%	↓ 21%

n: patients with RTI

The **reduction in average pathway costs per patient** is mainly **driven by the reduction in hospital referrals** (and for Italy additionally by reduction in laboratory tests).

# Take Aways



From a primary-care perspective, point-of-care tests may be considered an extra cost, it is however possibly rather to be conceived as an investment



An investment that saves costs in other sectors, avoids long-term AMR and gains QALYs



Next step: estimate QALYs related to resistance and link to short-term QALY gains, within the context of an integrative multi-sectoral model





# Thank you

Contact: [s.van.der.pol@umcg.nl](mailto:s.van.der.pol@umcg.nl)

The paper detailing these analyses is available online: <https://rdcu.be/cQlpp>

The model is available through GitHub:  
<https://github.com/UMCG-Global-Health/MERIAM/>







## Copyright 2019 VALUE-DX

This project has received funding from the Innovative Medicines Initiative 2 Joint Undertaking under grant agreement No 820755. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme and EFPIA and bioMérieux SA, Janssen Pharmaceutica NV, Accelerate Diagnostics S.L., Abbott, Bio-Rad Laboratories, BD Switzerland Sàrl, and The Wellcome Trust Limited.



innovative  
medicines  
initiative



[www.imi.europa.eu](http://www.imi.europa.eu)



[www.value-dx.eu](http://www.value-dx.eu)