Health-economic modelling of infectious disease diagnostics: current approaches and future opportunities

van der Pol, Simon; Rojas, Paula; Juarez-Castello, Carmello; van Asselt, A D I; Antonanzas, Fernando; Postma, Maarten

HEALTH-ECONOMIC MODELLING OF INFECTIOUS DISEASE DIAGNOSTICS: CURRENT APPROACHES AND FUTURE OPPORTUNITIES

Simon **van der Pol**, Paula **Rojas**, Carmelo **Juárez**, Thea **van Asselt**, Fernando **Antoñanzas**, Maarten **Postma**

University Medical Center Groningen (the Netherlands), University of La Rioja (Spain)

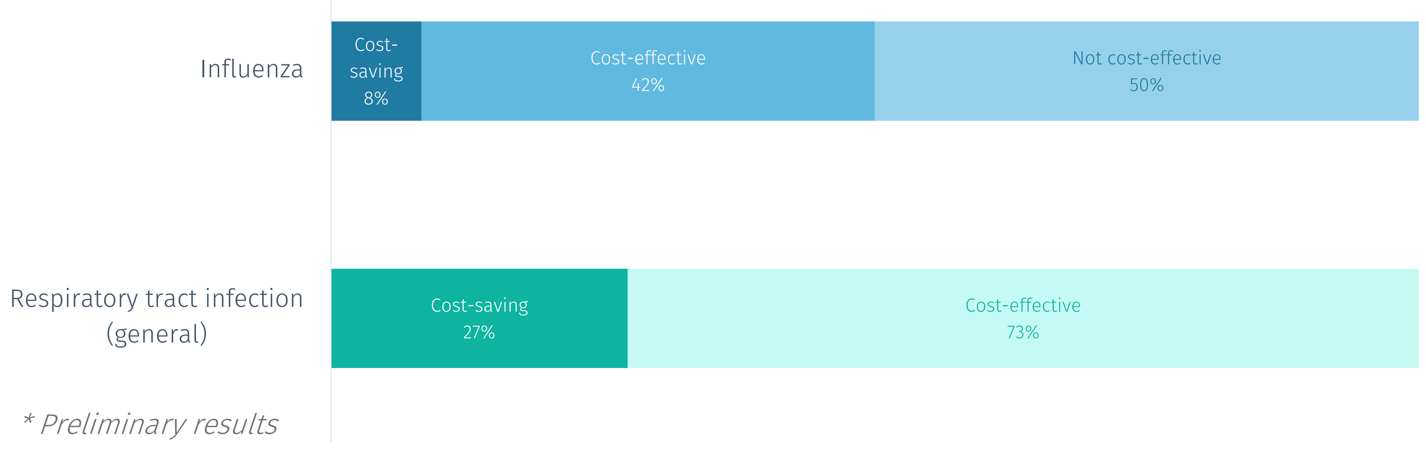
Background

Antimicrobial resistance (AMR) is a public health threat; infections with resistant organisms are estimated to cause over 650.000 infections and over 30.000 deaths in Europe[1]. AMR is associated with antibiotic consumption: appropriate prescribing of antibiotics is key in combating AMR[2,3]. To fight this threat, it has been suggested that point-of-care diagnostics to inform antibiotics prescribing are an important tool in reducing antibiotics prescriptions.

Main objectives

With the objective of knowing the state of the art on diagnostic, health-economic models, we reviewed cost-effectiveness analyses (CEAs) on diagnostics for infectious disease, focusing on model types and AMR.

General conclusions of articles in two disease areas*



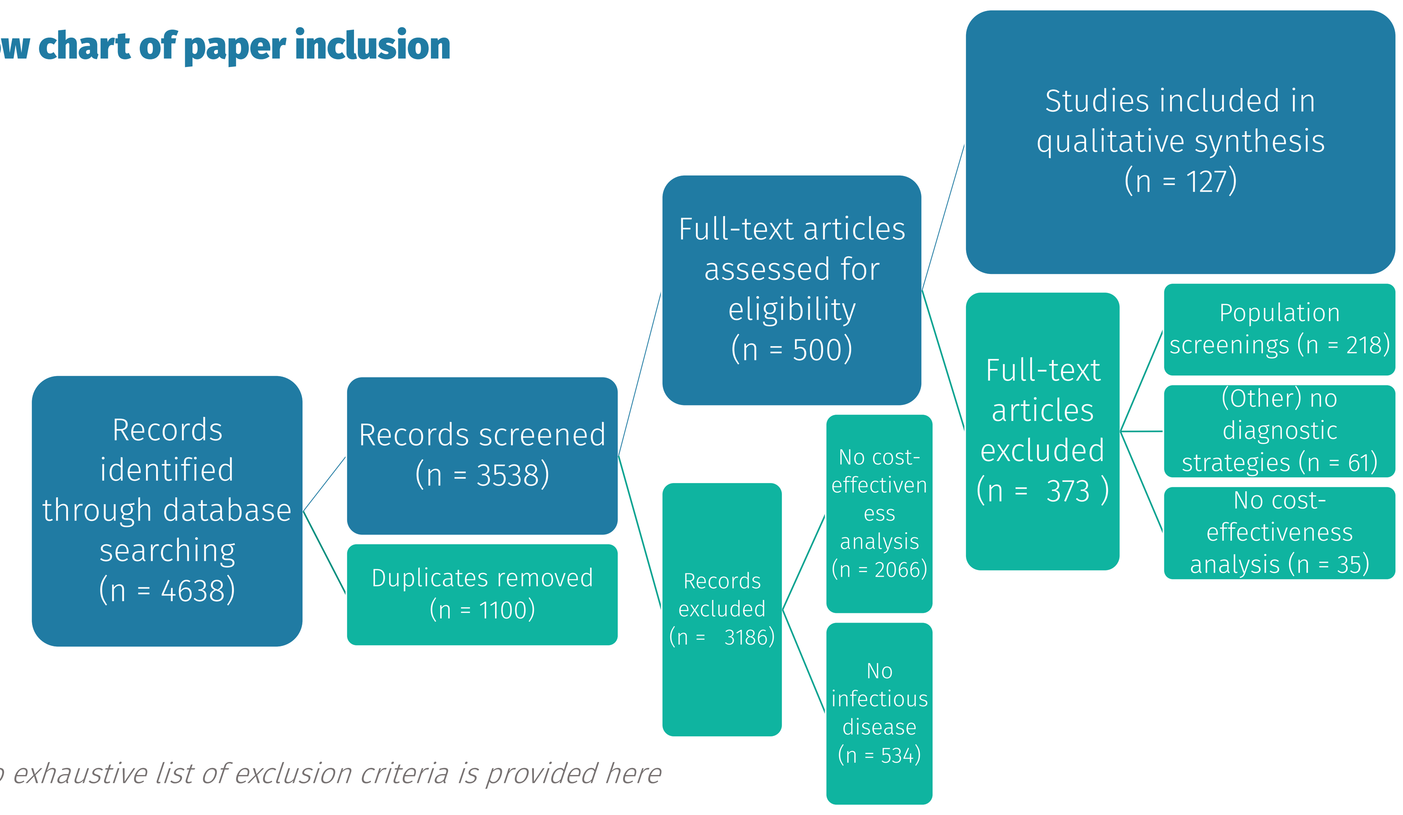
* Preliminary results

Key Findings

Most cost-effectiveness analyses dealing with diagnostics are for certain types of respiratory tract infections: such as general respiratory tract infections, influenza or tuberculosis. Sexual transmitted disease, malaria and gastroenteritis (e.g. helicobacter infections) are also common disease groups.

Although bacterial or viral resistance is often discussed in the included papers, it is rarely included in the analysis. Examples of methods to include resistance are: an ICER with prescriptions saved as an outcome; calculating the threshold cost of resistance that would change the conclusion of cost-effectiveness; or a point estimate of resistant pathogens.

Flow chart of paper inclusion



* no exhaustive list of exclusion criteria is provided here

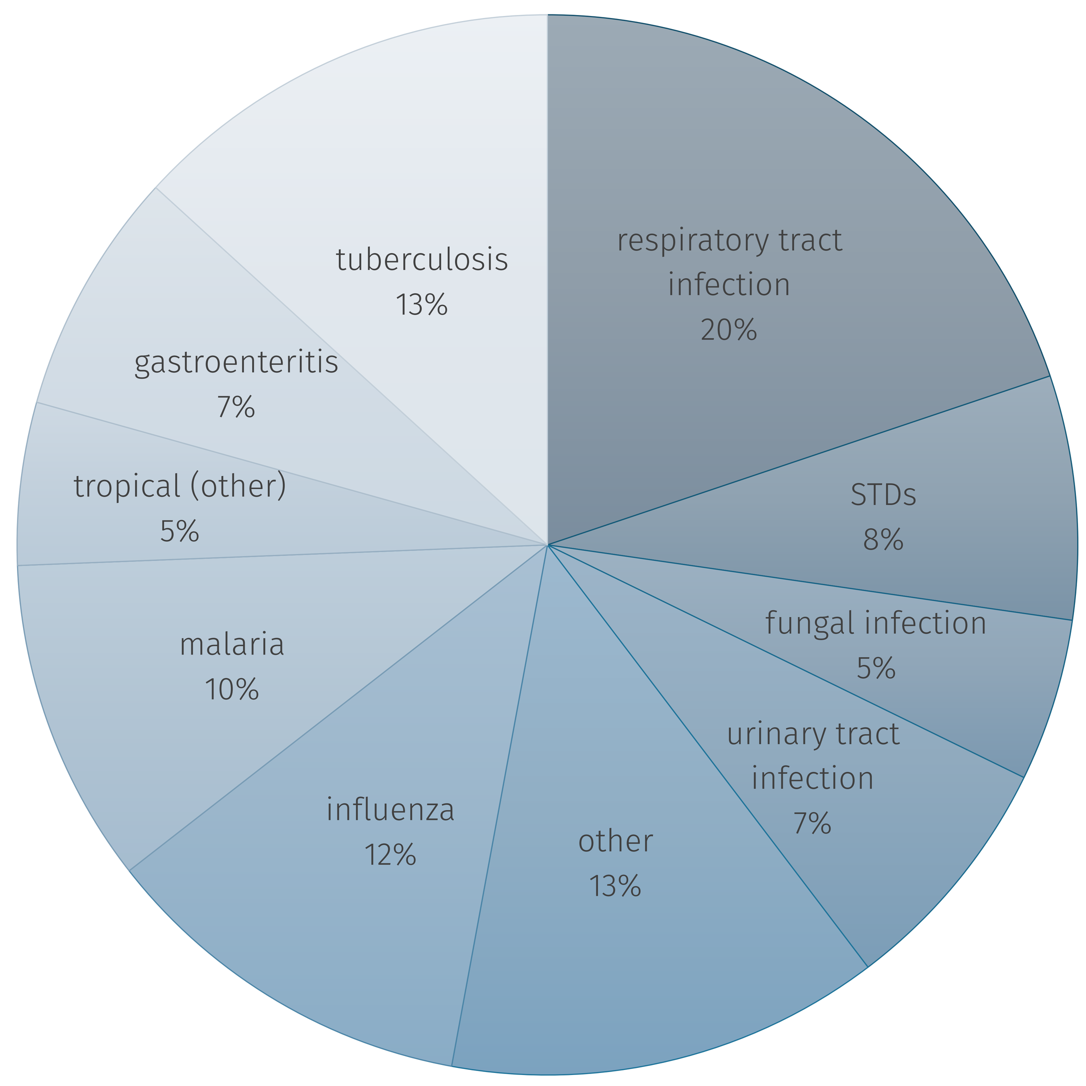
Methods

We searched the literature comprehensively through the PUBMED, Web of Science and EMBASE databases, as well as grey literature for the period 2000-2018. We included economic evaluations for diagnostic strategies for infectious disease in all geographic areas. Studies dealing with (population) screenings or disease monitoring were explicitly excluded. Data extraction was based on the CHEERS checklist[4], using a standardized digital (Google) form, with an emphasis on model types and inclusion of AMR.

Results

The flow diagram of included articles is shown above. Most papers are set in the primary care setting, followed by the hospital setting. A large majority of papers analyzed use a decision tree model for the calculation of quality-adjusted life years (QALYs) and costs. Often, these models use shorter time horizons, (e.g. one flu season), rather than a lifetime approach. The disease types investigated are shown in the pie chart below. Looking at the author's conclusions (see figure to the left), influenza diagnostics are not cost-effective in 50% of the articles, but for respiratory infections, improved diagnostics always is cost-effective or cost-saving.

Pie chart of disease types included in systematic review



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BibTeX file for articles included in review: https://tinyurl.com/y423k22k

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Correspondence: s.van.der.pol@rug.nl