

Evaluating the cost of antimicrobial resistance and errors in estimates: a systematic review and meta-analysis

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Abstract

Background: As the burden of antimicrobial resistance (AMR) increases worldwide, it is important for policymakers to accurately estimate the cost of AMR infections in standardized currencies. This systematic review and meta-analysis seeks to draw from diverse AMR costing studies to determine the cost of AMR resistance, determine the prevalence of study design errors, and to examine the impact of study design errors upon cost estimates.

Methods: Pubmed, Embase, Cochrane, and Web of Science were searched for systematic reviews of AMR costing studies. Studies in English reporting patient-level AMR cost between February 1990 and 2018 based on pre-specified criteria were considered. The presence of various design errors was evaluated using pre-specified criteria, and the relationship between error types was explored using regression techniques. Meta-regression was utilized to explore the relationship between design errors and costing estimates (STATA15).

Results: Of 266 retrievals, 55 unique studies were included representing a variety of organisms, antibiotic resistance types, study populations, and geographic locations. Statistically significant differences in cost were found depending on country income ($p=0.01$), whether the study took place in the USA ($p=0.01$), the organism stain ($p=0.01$), organism type ($p=0.02$), and antibiotic type ($p=0.01$), with an overall median AMR cost of 14932.28 June 2019 USD (95% CI, 14484.31, 15380.25). The majority studies (96.4%) analyzed included at least one type of study error. No relationship was found between study error types and AMR cost estimates.

Conclusions: The disparities in AMR cost based on country economic class, organism stain, organism type, and antibiotic type reflect differences in treatment modalities and reveal the difficulty in expressing one “overall” number expressing AMR cost. The high prevalence of design errors/strong error relationships reveals many AMR costing estimates are inaccurate, highlighting the need for more accurate models taking into account the effect of confounding factors and time on resistant infections.