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Incorporating uncertainty when designing packages of healthcare interventions: Implications for research priorities and investment decisions

Laetitia Schmitt, Beth Woods, Jessica Ochalek, Karl Claxton
Centre for Health Economics, University of York, York, UK

Introduction:

Decision-makers tasked with defining packages of interventions that are to address broad health indications (e.g. obesity, cardiovascular conditions, depression) or, to help achieve Universal Health Coverage of populations in low-and middle-income countries typically rely on secondary data on cost and benefits of intervention that is inevitably uncertain.

Recent advances in methods to supporting package design are based upon the quantification of interventions' value to the health care system, measured in population net health effects. The population net health impact associated with an intervention is the health expected to be generated to the population that stands to benefit from it, net of the health that could be gained if the resources required to fund it were made available for funding other healthcare interventions.

The presence of uncertainties in the evidence base that inform inclusion/exclusion decisions, however, means that including an intervention in a package that, based on currently available evidence appears cost-effective, could end up reducing overall population health, through its cost resulting in less health benefits than would be generated by existing healthcare interventions. Alternatively, the package could miss out on some interventions that would improve overall population health. Decision-makers, such as clinical guidelines development groups or health benefits package designers in low-and middle-income countries therefore face two key questions (1) Should additional research to inform decisions offer health benefits?; (2) Should the inclusion of an intervention be delayed until evidence from additional research is available? These two questions have, however, so far either been disregarded or not addressed in a transparent and consistent manner that accounts for the implications of decision uncertainty on healthcare resources allocation.

Method:

To help answer these two questions, we have developed a framework, implemented by a freely available stand-alone tool, to: (i) quantify the population net health effects of reducing uncertainty around the decision to include or exclude each of the interventions considered for the package; and (ii) identify when delaying inclusion until research reports could be appropriate.

Whilst the framework builds upon value of information methods that typically require probabilistic simulations, our tool simply requires the results of sensitivity analysis reported in cost-effectiveness studies and therefore addresses both the technical and data-related barriers to conducting uncertainty analysis.

To illustrate the framework developed, we applied the tool to the evidence base that informed the health benefit package for 2017-2022 designed to help foster Universal Health Coverage in Malawi.

Results:

Out of 21 interventions assessed, eight investment decisions were found to be uncertain and three showed strong potential for research to generate large health gains: 'male circumcision', 'community-management of acute malnutrition in children (CMAM)' and 'Isionazid preventive therapy in HIV+ individuals', with a potential to avert up to 65,762, 36,438 and 20,132 net DALYs respectively. We established maximum research periods during which delaying the implementation of cost-effective male circumcision and CMAM could be worth considering.

Conclusions:

Our work provides a method to quantify the population net health gains that research could generate by improving the design of healthcare interventions packages that either are targeted at a given indication or patient-subpopulation or consist of basic healthcare interventions to provide free-of-charge to population in middle-and-low income countries to achieve Universal Health Care.

Our quantitative estimates of the value of research can help inform research recommendations provided to research funders such as the NIHR Evaluation, Trials and Studies Coordinating Centre in the UK or Patient-Centered Outcomes Research Institute in the US. In a low-and middle-income country context, the identification of priority areas for research can provide a useful basis for communication between countries and international research funders.