

University of Groningen

## Exploring new ways of measuring the economic value of vaccination with an application to the prevention of rotaviral disease

Standaert, Baudouin Arnould Claire Ghislain Marie

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*

Publisher's PDF, also known as Version of record

*Publication date:*

2015

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Standaert, B. A. C. G. M. (2015). *Exploring new ways of measuring the economic value of vaccination with an application to the prevention of rotaviral disease*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen.

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

*Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.*

# 1 INTRODUCTION

**Economics of vaccines revisited. Hum Vaccin Immunother, 2013, 9(5), 1139-41 [1]**

MJ Postma  
and BA Standaert

What is today the relationship between value of prevention with vaccines and its health economic evaluation worldwide? That is the question I would like to answer in this thesis based on the example of rotavirus vaccination.

By specifying vaccine prevention the field of health economic assessment is narrowed, but it still opens a window of exploration to new research. Doesn't that sound a little odd?[2] Haven't we already assessed all the issues around health economics of vaccines since a long time? Almost every economic paper on vaccination will tell that this medical intervention is very cost-effective if not to say it is considered as one of the most cost-effective one ever introduced into the health care market.

What is meant by cost-effective is that vaccines are good value for money [3]. But the way this should be interpreted is broader than just the result of a cost-effectiveness analysis where extra payment for extra benefit is measured. The result often goes into the direction of cost-savings but one still prefers to say it is cost-effective. Therefore there are reasons for improvement in what we want to disclose whether vaccination is now cost-effective or leads to cost-saving.

Until recently –less than 15 years ago- we used the copy-paste function of the economic assessment of therapeutic interventions applied in the developed world [4]. We used that technique on prevention of the new vaccines coming in the market such as the ones against *hemophilus influenza B*, pneumococcal disease, rotavirus diarrhoea, and cervical cancer. We selected the incremental cost-utility analysis (ICUA) formula for the comparison of different disease management options and applied it on prevention as if the specificities of that field were the same as in treatment. Let me highlight through 3 particularities where things get distorted in the results when using the conventional cost-effectiveness analysis on prevention with vaccines.

First, the traditional health economic assessment technique came from an area of evaluating different therapies against a same disease with the focus on individual benefit. There is nothing wrong in doing this, but individual benefit limits the view on total value of prevention especially in transmissible diseases. Prevention works at the individual level but it then also heavily impacts the next level of evaluation which is the population. At that level there are different rules of epidemiological and of economic assessment that prevail than at the individual level. But we often forget to evaluate the population in our economic assessment of vaccines. The latter disturb the transmission of the pathogen in a susceptible population generating therefore additional indirect benefit amongst those who are unvaccinated which is called herd protection. That effect complicates the modelling of mimicking correctly the impact the vaccine has over time as the

benefit at the population level is bigger than the sum of the individual benefit of the vaccinated persons [5].

Second particularity is the price set for vaccines, highlighted by people unfamiliar with health economics, asking the question why vaccines don't cost so much. Vaccines prevent many deaths and save so many life years as they primarily act against infectious diseases in children with often high death rates. Should we then put a much higher price on those vaccines than what we are doing now [6]? Worse, if we compare vaccines with other prevention strategies used today such as statins that lower the blood cholesterol levels to prevent cardio-vascular diseases, one might be surprised to observe these specific preventative drugs cost more and benefit less than vaccines. How come? There are reasons that explain this paradox and I will briefly come back to that in the last chapter.

A related paradox concerns the economic assessment of vaccines in low- versus high-income countries (LICs versus HICs). The absolute benefit of vaccines is much higher in LICs than in HICs, whereas the payment is much higher in HICs than in LICs. The paradox is there but how to handle that correctly? Traditional economic assessment tools may not give us the full answer here.

Finally, we nicely evaluate the vaccine from within a silo-narrow perspective of the disease, focussing on the health and health care benefit but neglecting the broader perspective of all societal aspects. We almost forget to look outside the initial box to evaluate the problem into another new box—as said by Luc de Brabandere, 'it is scary to look outside the first box as there are no references to consider when being outside the familiar box' [7]. It brings us to underestimating the total value of vaccines. How to cope with undervaluing the total potential of a vaccine?

Bringing these 3 elements together – an economic assessment of the vaccine at the population or public health level we often miss to do; a price considered too low for the value the vaccine might give; a broader value impact by looking into new boxes – it should demonstrate that the economic assessment of vaccines we perform today with the traditional methods is far from being complete. Additional approaches should be sought. They could be more complex than what has conventionally been assessed within the therapeutic field but not always necessarily.

Meanwhile, the health economic assessment of a vaccination program can only be considered complete if we have the strength to think beyond the incremental analysis. Moreover incremental analysis is a technique that is confrontational as it selects between two options only: being cost-effective or not.

In practice we rarely apply this duality thinking about medical interventions because it is too restrictive to dismiss one option against the other. As a health care provider we like to maintain access to many ways of action when it comes to manage a disease. With that focus I propose to add an additional way of performing

health economics. It promotes the reflection about optimisation by looking for combination of different options and working under specific constraints while aiming to reach a specific health goal within a time frame [8].

It is already applied since a long time in many different sectorial domains of the economy that have a public demand such as handling the environment, making the world of transport efficient, shifting the energy delivery towards clean and renewable sources. We optimise what is reachable, but work under specific constraints of budget and logistics, among others. This is something we haven't applied enough in health care where major potential exists to be more efficient.

In the next chapter I will first use the conventional health economic approach of incremental cost-effectiveness analysis of rotavirus vaccination (see chapter 2-3). I may come to two evidences when positioning the value of vaccines worldwide. One is that in the developed world the introduction of a new vaccine is about a substitute in the existing health care system and organisation. Therefore all the values or all the benefits must be shown to become successful with the substitute (see chapter 4). Maybe cost-benefit analysis is for vaccines a better option than cost-effectiveness analysis in the economic value assessment of the product.

In the developing world is the positioning of a new vaccine different. We are exposed to an add-on program instead of a substitute. The economic value positioning of the vaccine is anymore about what to replace in the health care system, but about priority setting when working under constrained budgets. Here the technique should be about budget optimisation and obtaining a good return on investment (chapter 5).

In the last chapter 6 I give additional reflections about where to go with these findings and what type of next research steps should be considered.