Comparative economic evaluation of Haemophilus influenzae type b vaccination in Belarus and Uzbekistan


Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
This study examined the cost-effectiveness of Haemophilus influenzae type b (Hib) vaccination in a country relying on its own finance (Belarus) and a country eligible for GAVI Alliance support (Uzbekistan). The authors concluded that Hib vaccination was highly cost-effective in Uzbekistan and cost-effective in Belarus. This higher cost-effectiveness in Uzbekistan was mainly due to high mortality without vaccination. The framework was valid and most of the assumptions were clearly reported. The authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
This study examined the cost-effectiveness of vaccination against Haemophilus influenzae type b (Hib) in a country relying on its own finance (Belarus) and a country eligible for GAVI Alliance support (Uzbekistan).

Interventions
A four-dose vaccination schedule, at three, four, five, and 18 months, was considered for Belarus, and a three-dose schedule, at two, three, and four months, was considered for Uzbekistan.

Location/setting
Belarus and Uzbekistan/primary care.

Methods
Analytical approach:
The analysis was based on a static, compartmental cohort model. The authors stated that it was carried out from the perspective of society.

Effectiveness data:
The clinical data were from a selection of relevant studies. Most of the epidemiological evidence was from a case series of many patients, and official surveys and databases (mainly surveillance studies) in the two countries or other countries in the same geographic area. Vaccine coverage was from the United Nations Children’s Fund (UNICEF) and the World Health Organization (WHO). Vaccine efficacy was from published studies. The case fatality rates (CFRs) were the key inputs for the model and were mainly from country-specific sources, and authors’ calculations and assumptions.

Monetary benefit and utility valuations:
The disability weights for meningitis, pneumonia, and sequelae were from a published source.

Measure of benefit:
Deaths and disability-adjusted life-years (DALYs) averted were the summary benefit measures. A 3% annual discount rate was applied to the DALYs.

Cost data:
The economic analysis included the costs of vaccination, drugs, out-patient visits, and hospitalisations for pneumonia. Patient and carer costs for drugs and the lifetime treatment of meningitis sequelae were considered. All costs were from...
official country-specific sources, except those for the treatment of meningitis sequelae, which were from a Russian study. The vaccine cost was determined by the manufacturer for Belarus and was the price set by UNICEF for the GAVI Alliance in Uzbekistan. The patterns of resource consumption were from country-specific studies and reviews of patient records at selected health facilities in each country. All costs were in US dollars ($) and were discounted at an annual rate of 3%. The price year was 2009.

Analysis of uncertainty:
Alternative scenarios were considered, varying the incidence estimates and CFRs, as well as the rates of access to care, vaccine price, discount rate (zero), and herd immunity. Alternative values were mainly assumed by the authors.

Results
In Belarus, compared with no vaccination, Hib vaccination led to annual net costs of $1,420,582, and averted three deaths or 152 DALYs. The incremental cost per death averted was $485,567 and the incremental cost per DALY averted was $9,323.

In Uzbekistan, vaccination led to annual net costs of $3,057,930, and averted 334 deaths or 11,473 DALYs. The incremental cost per death averted was $9,162 and the incremental cost per DALY averted was $267.

Much more favourable estimates were observed without discounting or when using a lower vaccine price, but in general vaccination remained cost-effective in both countries, considering their gross domestic product (GDP) per capita, which was $5,560 in Belarus and $1,100 in Uzbekistan.

Authors’ conclusions
The authors concluded that Hib vaccination was highly cost-effective in Uzbekistan and cost-effective in Belarus. This higher cost-effectiveness in Uzbekistan was mainly due to high mortality before the introduction of the vaccine.

CRD commentary
Interventions:
Vaccination was compared against no immunisation, which was the usual situation in several settings.

Effectiveness/benefits:
The clinical and epidemiological estimates were mainly from large surveillance studies, conducted in Belarus and Uzbekistan, which should be representative of these two countries. The authors acknowledged that high uncertainty was found in some of the data and this was investigated in the sensitivity analysis. Other data were from valid sources, such as UNICEF and the WHO. The assumptions and the calculations were well described and justified. DALYs were appropriate as the main benefit measure, as pneumonia and meningitis have an impact on both mortality and morbidity. The authors stated that the disability weights were from standard sources, but these were not described.

Costs:
The authors justified the use of a societal perspective, but transport and productivity costs were not considered as no data were available. It is unclear what impact these costs might have had on the cost-effectiveness results. The key unit costs and resource quantities were presented. The data sources were clearly reported and reflected the national setting for each country. Some of the data were from a published study, conducted in Russia. Reflation exercises should be possible as the price year was stated. The costs were treated deterministically and only variations in the vaccine costs were tested in the sensitivity analyses.

Analysis and results:
Only the incremental results for vaccination over no vaccination were presented. These incremental costs and benefits were synthesised appropriately. The uncertainty was partly investigated by varying selected inputs to the model. The authors compared their results with those from other studies, conducted in low-income countries, which generally showed that vaccination was cost-effective. These results can be transferred to settings with similar epidemiology and similar income levels. The authors acknowledged that a dynamic model could have considered changes over time, but there was insufficient data to populate this type of model.
Concluding remarks:
The framework was valid and most of the assumptions were clearly reported. The authors’ conclusions appear to be robust.

Funding
Funded by the GAVI Alliance.

Bibliographic details

PubMedID
21720546

DOI
10.1371/journal.pone.0021472

Original Paper URL
http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0021472

Indexing Status
Subject indexing assigned by NLM

MeSH
Bacterial Capsules /administration & dosage /economics; Child; Cohort Studies; Cost-Benefit Analysis; Decision Support Techniques; Haemophilus Vaccines /administration & dosage /economics; Health Status Indicators; Humans; Meningitis, Haemophilus /economics /epidemiology /immunology; Republic of Belarus /epidemiology; Sensitivity and Specificity; Uzbekistan /epidemiology; Vaccination /economics

AccessionNumber
22011001240

Date bibliographic record published
28/09/2011

Date abstract record published
07/12/2011