Economic evaluation of general childhood vaccination against Haemophilus influenzae type B in Sweden

Garpenholt O, Silfverdal S A, Levin L A

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.

Health technology
General childhood vaccination against Haemophilus influenzae type B (HiB).

Type of intervention
Primary prevention.

Economic study type
Cost-benefit analysis.

Study population
The study population comprised children aged 0-4 years.

Setting
The setting was primary care. The economic study was carried out in Sweden.

Dates to which data relate
Effectiveness evidence came from studies published between 1984 and 1996. All costs came from a study published in 1996 pertaining to the period 1987-1992, except for the cost of hearing loss and deafness for which no year was given.

Source of effectiveness data
The data were derived from a review of previously completed studies.

Modelling
A decision tree was used to compare vaccination with no vaccination, incorporating parameters for various probabilities, for the 1987-94 cohort of 550,803 0-4 year olds in Sweden.

Outcomes assessed in the review
The outcomes assessed were parameters for the model and included the incidence of HiB, vaccine coverage and efficacy, the incidence of meningitis, epiglottitis and other manifestations of disease, as well as their sequelae in terms of disability and death.

Study designs and other criteria for inclusion in the review
Not reported.
Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
The number of studies was 13.

Methods of combining primary studies
Not reported, although several parameter estimates had more than 1 reference.

Investigation of differences between primary studies
Not reported.

Results of the review
The figures in brackets are the ranges from all references.

Incidence of HiB was 54/100,000/year.

Vaccine coverage was 99%.

Vaccine efficacy was 95% (95 to 100%).

Incidence of meningitis was 56%. Incidence of recovery without sequelae was 78.4%. Incidence of death was 3.3% (2.5 to 3.8%).

Incidence of epiglottitis was 24%. Incidence of recovery without sequelae was 98%. Incidence of death was 1.2% (0 to 3.1).

Incidence of other manifestations of disease was 20%. Incidence of recovery without sequelae was 99%. Incidence of death was 1% (0 to 3.3%).

Measure of benefits used in the economic analysis
The avoidance of death was valued from willingness to pay to avoid death in traffic accidents. Although not stated explicitly, severe disability was valued by its consequences on reduced life expectancy, i.e. 30 years compared to the normal life expectancy of 75 years. The willingness to pay estimate then seems to have been adjusted proportionately.

Direct costs
Discounting was carried out. The "average" number of outpatient visits and hospital days was given. The number of audiology consultations for children with meningitis was reported, as was the number of hours in the intensive care unit (ICU). The costs of hospitalisation and outpatient visits were estimated based on charges from the Orebro medical centre hospital in 1996. These were stated to include fixed and variable costs by department. The lifetime cost of hearing loss, either severe/deaf or moderate were stated to include the costs of special school education, hearing aids,
and visits to a specialist. They were stated to be obtained from the board of education, the county councils and the audiology department. The lifetime cost of HiB-induced disability, including visits to rehabilitation centres, technical advice, orthopaedic surgery, and special education was also calculated, 'in collaboration with a neuropaediatrician'. The price per dose of HiB vaccine and administration cost for the child health centre were also provided. The price year was 1995.

**Statistical analysis of costs**
No statistical analysis was reported, although 'average' costs were given.

**Currency**
Swedish kroner (SEK).

**Sensitivity analysis**
The rates for all sequelae were reduced by 50% from the base case. Discount rates of 10% and 5% were used instead of 0% in the base case. The costs of severe disability were reduced by 25, 50 and 75% and were stated to be increased "with cost of a "personal assistant"". Different rates of incidence, and vaccine coverage were used. The percentage of children not covered due to young age (under 6 months) was tested also at 5% and 10%. Instead of the Swedish 3-dose regime, a 1-dose regime was tested.

**Estimated benefits used in the economic analysis**
The results of the monetarised value of premature death were not given separately from the final result, which included direct and indirect costs.

**Cost results**
The 'average' cost per cohort was: SEK 59,298,000 without vaccination versus SEK 49,824,000 with vaccination, giving a net cost with vaccination of SEK -9,474,000 or -17 per cohort member. The discount rate was 5%.

**Synthesis of costs and benefits**
These figures are indirect plus direct costs as above, plus the monetarised value of the health benefits, giving final costs of SEK 140,772,000 without vaccination versus SEK 52,774,000 with vaccination and net savings of SEK 87,999,000 or SEK 160/cohort member.

Sensitivity analyses still revealed a positive net benefit (-1*net cost) when rates of sequelae were reduced by 50% and down to an incidence of HiB of 19/100,000/year. Discount rates were stated to “show little impact on the results.” Decreases in net benefit occurred with vaccine coverage, efficacy and coverage due to low age, but still with a positive net benefit. A one-dose regime increased net benefit to SEK 217/cohort member.

**Authors' conclusions**
HiB vaccination is cost saving, even without accounting for health benefits. Accounting for health benefits, it will save about SEK 88 million when it is "totally implemented".

**CRD COMMENTARY - Selection of comparators**
No justification was given for the choice of no vaccination. Since vaccination had already been introduced in Sweden, the authors seemed to be interested in its cost-benefit post hoc. This information could be useful for countries that have not yet introduced the vaccine.
Validity of estimate of measure of effectiveness
The use of mortality was appropriate. However, the authors seem to have only accounted for other consequences of disease by their effect on longevity, which was then valued monetarily. There might therefore be a case for producing a cost-effectiveness analysis to account for these other consequences. The authors did state that, in their review, the regional study was used to give more detailed information, but where there were discrepancies, “larger published studies” were used. However, no information was presented about the methods of searching for and selecting these studies. Also, for some parameter estimates, more than one reference was given, but the method of combination, for example median and range, was not given.

Validity of estimate of measure of benefit
The authors acknowledged the limitation of using a willingness to pay estimate based on traffic accidents rather than the actual health consequences of HiB. They suggested that the actual value would be higher, given the value of preventing children's deaths. An excellent appraisal of the methodological issues surrounding CBA and the difficulties in obtaining a valid monetary estimate for costs and benefits was given in the paper.

Validity of estimate of costs
The coverage of costs was fairly comprehensive, and the authors presented many resource quantities and prices separately in order to facilitate generalising to other settings. Generalisability is also helped by the fact that the price year was reported. Only lifetime costs were not broken down, although they probably account for a large proportion. Sensitivity analyses also enabled the testing of generalisability, although the variation in parameter estimates seemed to be arbitrary and all analyses were one-way. You, as a user of this database, must make comparison with the estimates in your own setting.

Other issues
Issues of generalisability were discussed and favourable comparisons with other studies were mentioned by the authors. The authors did not seem to present their results selectively and the conclusions which they drew were relevant to the population and study question.

Implications of the study
The results suggest that childhood HiB vaccination is cost beneficial in Sweden. As the authors stated, “the cost of treatment and health care differs greatly between countries...”. They therefore advocate national studies to test for generalisability, arguing that the cost of such studies is cheap relative to the programme itself. Health care decision-makers need to consider this cost in relation to the potential saving of not doing such research and taking the risk of lack of generalisability.

Source of funding
Supported by grants from the Research Committee of the Orebro County Council and Pasteur Merieux/MSD Copenhagen.

Bibliographic details

PubMedID
9670351

Indexing Status
Subject indexing assigned by NLM