Cost-benefit analysis of Haemophilus influenzae type b immunization in Korea

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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 compared the costs and effects of adding a Haemophilus influenzae type b (Hib) vaccine to the current national immunisation programme in Korea. The authors concluded that adding the Hib vaccine to the current national childhood immunisation programme was not cost efficient in Korea due to the low incidence rates of Hib disease and high cost of the vaccine. Despite some limitations, overall, the authors' conclusions appear to be reasonable.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The purpose was to assess the potential costs and benefits of a Haemophilus influenzae type b (Hib) vaccine for the prevention of meningitis, pneumonia and other childhood infections. The Hib vaccine was added to the current universal immunisation programme in Korea.

Interventions
The Hib vaccine in combination with the current national immunisation programme for children was compared with the current programme without Hib vaccine. The vaccine was designed to be administered to infants at two, four, and 12 to 15 months old.

Location/setting
Korea/primary prevention.

Methods

Analytical approach:
A decision analytic model was used to determine the numbers of infants that would end up with specific illnesses or no illness and the corresponding care and productivity costs. The costs and effects were analysed for the 2003 birth cohort of 493,471 infants, over a long-term, but unspecified, time horizon. The authors stated that a societal perspective was taken.

Effectiveness data:
The effectiveness data were derived from the combination of published literature and national cancer resources. One pivotal study was relied on for Korean population-based estimates for annual incidence of Hib meningitis in children under five years old (Kim, et al. 2004, see ‘Other Publications of Related Interest’ below for bibliographic details). The methods used to identify the studies from the literature were not stated. The main clinical endpoints were the cases of invasive disease (pneumonia, meningitis, and others), deaths, and sequelae from Hib meningitis (hemiplegia, hearing loss, epilepsy, and mental retardation). Several assumptions were made regarding the model parameters and these were clearly reported and supported with references.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The measures of benefit were the cases averted, sequelae averted, and lives saved. The authors did not report whether these were discounted.
Cost data:
The types of resources included immunisation costs (vaccine and administration), costs associated with Hib disease treatment and meningitis sequelae, and cost-offsets related to the avoided loss of parental income, loss of children's future income, and travel costs for treatment. The vaccine cost was valued using private clinic fees. Productivity losses were estimated using the human capital approach and valued using average daily wages. Other prices were sourced from national reports and claims data. The unit costs and their sources were reported. Costs were discounted at 5%, adjusted to 2003 prices, where appropriate, using the Consumer Price Index, and reported in Korean won (KRW). The 2003 exchange rate used was one US dollar equalled KRW 1,200.

Analysis of uncertainty:
One-way and multi-way sensitivity analyses were performed to test the base-case results against changes in three parameters: vaccine price, discount rate, and incidence of Hib disease. Vaccine prices were reduced from the base-case analysis to reflect bulk purchases within a national programme. The results were presented as benefit-cost ratios.

Results
In combination with the existing childhood immunisation programme, adding the Hib vaccine would reduce the incidence of Hib; with a birth cohort of 493,471, 280 cases of invasive disease, 17 deaths, and 59 meningitis sequelae were avoided.

The discounted costs of the immunisation (vaccine and administration) were KRW 34,641,664,000 and cost-offsets were KRW 26,708,274,000. Therefore, the net costs were KRW 7,933,390,000 and the total cost of Hib immunisation was KRW 34,600,000,000.

Using the direct costs of the vaccination programme only, the discounted average cost-effectiveness ratio for Hib was KRW 2,037,745,000 per life saved, KRW 123,720,000 per case averted, and KRW 587,147,000 per sequela averted.

The base-case benefit-cost ratio (direct costs to cost-offsets) was 0.77, which means that the future costs saved were less than the vaccination costs. This ratio was very sensitive to different combinations of discount rates, incidence of Hib disease, and immunisation cost. Cost-savings (with a benefit-cost ratio over 1.0) were generated when the Hib incidence was 8.1 in 100,000 persons and immunisation cost was KRW 20,000 and when incidence was 16.1 in 100,000 regardless of the discount rate and immunisation cost.

Authors’ conclusions
The authors concluded that adding the Hib vaccine to the current national childhood immunisation programme was not cost efficient in Korea due to the low incidence rates of Hib disease and high cost of the vaccine.

CRD commentary
Interventions:
The new Hib vaccination programme was clearly described along with the current vaccine uptake in Korea (50% uptake via private practices). The profile of the intended patient population and schedule of vaccinations were clearly reported.

Effectiveness/benefits:
The authors did not state the selection criteria for the clinical data. For the epidemiological data, the data were derived from various published studies, and the authors appear to have selected recent studies that were most relevant to the Korean population. An assessment of life-years saved or quality-adjusted life-years saved would have strengthened the study and provided more generic outcomes for comparison with other cost-effectiveness analyses. An illustration of the model structure was presented and all assumptions and estimates were justified and reported. Discounting was not applied to long-term clinical outcomes, and this may have been important to assess within a sensitivity analysis.

Costs:
The costs reflected those applicable to the societal perspective. The costing methods, adjustments, their sources, and unit costs were thoroughly documented and the costs were adjusted for inflation.

Analysis and results:
The health outcomes and net costs were synthesised into benefit-cost ratios. The authors stated that a cost-benefit analysis was undertaken. However, because the benefits were not valued using willingness-to-pay methods (which do measure benefits in monetary units), but were cost-offsets or downstream cost-savings, they would normally be included in the numerator of the cost-effectiveness ratio (the costs). The scarcity of evidence for disease incidence parameters in Korea was discussed by the authors. The sensitivity analyses tested the key parameters over sufficiently large variations. The authors identified and justified a number of limitations to their study, including the source of the price estimates and their uncertainty. The authors thoroughly discussed their results in comparison with other economic studies in the Asian and Western regions and the potential impact on these results.

Concluding remarks:
Overall the methods were appropriate and transparently reported, although there were limitations with the discounting of the clinical outcomes and lack of incremental analyses. The authors’ conclusions appear to be a reasonable assessment of the scope of the analysis.

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