Forecasting the economic value of an enterovirus 71 (EV71) vaccine

Lee BY, Wateska AR, Bailey RR, Tai JH, Bacon KM, Smith KJ

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 potential cost-effectiveness of vaccination against enterovirus 71 for children aged between six months and five years, from the perspective of the third-party payer. The authors concluded that the mass childhood enterovirus 71 immunisation programme was cost-effective as long as the vaccine cost (including administration) remained below 25 US dollars, or high-risk populations were vaccinated. The methods were valid, but the data sources were poorly reported. The authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-utility analysis

Study objective
This study examined the potential cost-effectiveness of vaccination against enterovirus 71 for children aged between six months and five years.

Interventions
Enterovirus 71 vaccination as an addition to the routine immunisation programme was compared against no vaccination.

Location/setting
China/primary care.

Methods
Analytical approach:
The analysis was based on a decision model, with a lifetime horizon. The authors stated that it was conducted from the perspective of the third-party payer.

Effectiveness data:
The clinical inputs appear to have been from a selection of relevant sources, including country-specific administrative databases of disease surveillance. The baseline risk of disease-related health events was the key input for the model and was from Chinese databases and United Nations International Children's Emergency Fund (UNICEF) data. Vaccine efficacy was varied over a large range of values. Some assumptions were needed.

Monetary benefit and utility valuations:
The disutility weights were from a World Health Organization (WHO) publication that assessed the global burden of disease.

Measure of benefit:
Disability-adjusted life-years (DALYs) were the summary benefit measure.

Cost data:
The economic analysis included the costs of vaccination (vaccine acquisition and administration), treatment of side-effects, and the in-patient and out-patient costs of the following health conditions: encephalitis, myocarditis, aseptic meningitis, pulmonary oedema, acute flaccid paralysis, hand foot and mouth disease, and herpangina. These costs were identified by an extensive search of the literature and from the US Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample. US costs were adapted to the Chinese setting using a specific multiplier. The price year was 2010 and all costs were reported in Chinese yuan and US dollars ($).
Analysis of uncertainty:
Deterministic sensitivity analyses were carried out on the key variables, including vaccine costs, patient age, enterovirus 71 risk, vaccine efficacy, and the US to Chinese cost multiplier. Arbitrary ranges of values were used as well as published ones. A probabilistic sensitivity analysis was carried out to consider the effects of varying all parameters simultaneously using published and assumed ranges of values.

Results
Using the WHO criterion of the country's gross domestic product as a cost-effectiveness threshold, vaccination was cost-effective when it cost $25 or less. At the enterovirus 71 risk in China at the time of 0.04% and 70% vaccine efficacy, the incremental cost per DALY averted was $3,169 at a vaccination cost of $10 and $7,306 at a vaccination cost of $25. Above these prices, vaccination was cost-effective only when assuming higher vaccine efficacy or a higher risk of disease.

The risk of disease was the most influential input. Assumptions on the US to Chinese cost multiplier did not affect the base-case conclusions.

Authors' conclusions
The authors concluded that the mass childhood enterovirus 71 immunisation programme was cost-effective as long as the vaccine cost (including administration) remained below $25, or high-risk populations were vaccinated.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear as the proposed vaccination was compared against no immunisation, which was the usual care in many health care settings.

Effectiveness/benefits:
The selection of country-specific studies and databases for the clinical inputs for the model was justified, but little information was given on these clinical sources, hindering a full assessment of their validity. Vaccine efficacy was based on assumptions and was varied over a wide range in the sensitivity analyses. The disability weights used to calculate DALYs were from an appropriate source, but its details were not reported. DALYs were a valid benefit measure, and they capture the impact of infection on both survival and disability.

Costs:
The cost categories were consistent with the perspective. A breakdown of cost items was not presented and only cost category totals were reported. The costs were from a US source and were converted to Chinese prices using an official multiplier; variations of this multiplier did not affect the base-case conclusions. The price year was presented, which will allow reflation exercises for other time periods. The cost estimates appear to have been treated deterministically and only the vaccine cost (including administration) was varied in the deterministic sensitivity analysis.

Analysis and results:
The results were selectively reported, with only the incremental cost-utility ratios being presented. These incremental ratios were extensively presented for various scenarios with combinations of possible prices, disease risks, and vaccine efficacy. The authors did not state if discounting was applied and it would have been relevant given the long time horizon. The uncertainty was assessed by varying the key inputs only. The authors mentioned a multivariate probabilistic analysis, but did not report the results. The study results appear to be specific to the Chinese context and might be generalisable only to countries with similar epidemiology and cost structures.

Concluding remarks:
The methods were valid, but the data sources were poorly reported. The authors’ conclusions appear to be robust.

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