Economic analysis of the Global Polio Eradication Initiative
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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
The objective was to examine the cost-effectiveness and net benefits of the global polio eradication initiative (GPEI) considering the status of the programme that started in 1988 and two potential vaccine policies after eradication in various world areas. The authors concluded that the GPEI was very cost-effective, despite its rising costs. The cost-effectiveness framework was conventional and the authors’ conclusions appear to be robust, despite the need for several assumptions.

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

Study objective
The objective was to examine the cost-effectiveness and net benefits of the global polio eradication initiative (GPEI) considering the status of the programme that started in 1988 and two potential vaccination policies after eradication for various world areas.

Interventions
The GPEI intervention seeks to interrupt the circulation of wild polioviruses using routine immunisation, supplemental immunisation activities, high-quality surveillance, and risk-management policies. Following the assumed certification of wild poliovirus eradication from all populations in 2016 and globally coordinated cessation of oral polio vaccination, the analysis considered two vaccination policies: universal inactivated polio vaccine and no routine vaccination. The analysis compared the interventions with the comparator of only routine vaccination.

Location/setting
Global (104 countries; 64 with low income, 35 with lower-middle income, and five with upper-middle income)/primary care.

Methods
Analytical approach:
The analysis was based on a historic and projected data on incidence and costs for the intervention and a dynamic transmission model for the comparator. The time horizon was from 1988 to 2035. The authors stated that a societal perspective was adopted.

Effectiveness data:
The clinical data came from a selection of relevant studies, which used estimates from the World Health Organization (WHO) and other international institutions, as well as published reports and registries. Other data were from a published dynamic transmission model for polio eradication, created by some of the authors of this study (Duintjer Tebbens, et al. 2008, see ‘Other Publications of Related Interest’ below for bibliographic details). Historical discrepancies in the data sources were considered and assumptions were required to estimate the decline in disease incidence over time. The incidence of disease was the key input for the model and was from most of these sources.

Monetary benefit and utility valuations:
Disability weights were derived from published sources that included the previous dynamic transmission model.

Measure of benefit:
The two benefit measures were poliomyelitis cases avoided and disability-adjusted life-years (DALYs) averted. A 3%
annual discount rate was applied and varied from 0 to 7% in a sensitivity analysis. The net benefit was calculated assuming that each DALY saved was valued at the average per person gross national income (GNI) for one year in each country.

Cost data:
The economic analysis included the costs of the GPEI programme (including internal contributions for countries receiving external funds), the cost of vaccine acquisition and administration, the indirect costs of vaccination (personnel, training, refrigerated transport, buildings, and equipment), and the treatment of paralysis from poliomyelitis. The economic data were from published studies and the GPEI external funds database; some assumptions were made. The costs were in US dollars ($), for the price year 2008, and a 3% annual discount rate was applied and varied from 0 to 7% in a sensitivity analysis.

Analysis of uncertainty:
Univariate sensitivity analyses were conducted on some of the model parameters and assumptions, such as the discount rate, the ratio of internal to external contributions to the GPEI, the incidence of polio in 1988, the delay in achieving eradication, the inactivated polio vaccine prices, and the coverage with the usual vaccination (comparator).

Results
With GPEI then universal inactivated polio vaccine, compared with usual vaccination, the incremental cost per paralysis prevented was $2,700 in low-income, and $14,000 in lower middle-income countries, and it was dominant as it was more effective and less expensive in upper middle-income countries. The incremental cost per DALY saved was $210 in low-income, and $1,000 in lower middle-income countries, and it was dominant in upper middle-income countries. The incremental net benefit (assuming one DALY was valued at one year of the average GNI per capita) was $37 billion for low-income, $4.5 billion for lower middle-income, and $0.41 billion for upper middle-income countries.

With GPEI then no routine vaccination, compared with usual vaccination, the incremental cost per paralysis prevented was $1,900 in low-income, and $1,100 in lower middle-income countries, while it was dominant in upper middle-income countries. The incremental cost per DALY saved was $140 in low-income, and $79 in lower middle-income countries, and it was dominant in upper middle-income countries. The incremental net benefit was $40 billion in low-income, $6.5 billion in lower middle-income, and $0.43 billion in upper middle-income countries.

The results of the sensitivity analysis confirmed that the base case findings were robust; the monetary valuation of a paralytic polio case, the discount rate, the inclusion or exclusion of the benefits of vitamin A, and the assumption about vaccination coverage for the comparator were the most influential parameters.

Authors' conclusions
The authors concluded that the GPEI was very cost-effective, despite its rising costs.

CRD commentary
Interventions:
The rationale for the selection of the comparators was appropriate and applied to many countries worldwide.

Effectiveness/benefits:
No systematic review was reported to identify the relevant sources of data and some might have been omitted. The key data were from WHO reports, which assessed the actual epidemiology in each country. Some data were from the previous dynamic transmission model. Several assumptions were required for the long-term epidemiology of the disease in the alternative scenarios and for other inputs. Sensitivity analyses were carried out on these assumptions. The benefit measures were appropriately selected as they included the societal willingness to pay to prevent lost productivity and suffering from permanent paralysis. DALYs allow comparisons to be made with the benefits of other health care interventions, with the description of the derivation of the disability-adjusted values limited to references of more detailed descriptions of the derivation (Duintjer Tebbens, et al. 2008).

Costs:
The cost categories reflected the perspective of the analysis. A large number of countries were included, which meant
that the costs were mainly presented as category totals for the three groups of countries based on their income. The costs of the GPEI were from the programme's fund database, which is likely to have been comprehensive. Other data were from the previous dynamic transmission model and these should reflect the disease progression. The price year and discount rate were reported and the key cost data were varied in the sensitivity analysis.

Analysis and results:
The results were selectively presented, as only the incremental ratios were reported for all the countries, consistent with the global perspective of the analysis. The projected costs and cases were presented in graphical form. The uncertainty was investigated by considering alternative assumptions and published ranges of values for most of the inputs. The analysis covered more than 100 countries, grouped by level of income, that directly benefit from the GPEI. The main limitation of the analysis appears to have been the need for assumptions, but the results were generally robust to changes in these assumptions.

Concluding remarks:
The cost-effectiveness framework was conventional and the authors' conclusions appear to be robust, despite the need for several assumptions.

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