The risks, costs, and benefits of possible future global policies for managing polioviruses

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 assess the costs and benefits of possible future major policy decisions on the vaccination, surveillance, response plans, and containment following global eradication of wild polio viruses. For groups currently using OPV, the authors concluded that after successful eradication of wild polioviruses, OPV cessation will save both costs and lives when compared to continued use of OPV without supplemental immunization activities (SIAs). Overall the methodology was adequate, but the paper did not provide any details of the methods of the literature review. The results were reported adequately and the authors’ conclusions appear to be appropriate.

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

Study objective
The objective was to assess the costs and benefits of possible future major policy decisions on vaccination, surveillance, response plans, and containment following global eradication of wild polio viruses.

Interventions
The interventions were: no routine programme; vaccination with oral polio virus vaccine (OPV); vaccination with inactivated polio virus vaccine (IPV); and vaccination with OPV plus supplemental immunisation activities.

Location/setting
Global/community care.

Methods
Analytical approach:
A decision analytic model was used to estimate the cost-effectiveness of the risk management options for polio for 20 years following the expected end of routine vaccination with OPV. The time horizon of the model was 20 years. The perspective was not reported, although the authors have since stated that it was societal.

Effectiveness data:
The clinical and effectiveness data were derived from published studies and the authors' assumptions. The methods used to select the relevant studies, and those of a review of the literature, were not reported. The authors have since stated that the studies used were relevant literature reviews (see Duintjer Tebbens et al in Other Publications of Related Interest). The main measure of clinical effectiveness was the outbreak-specific routine immunisation coverage.

Monetary benefit and utility valuations:
Disability-adjusted life-years (DALYs), due to prevented paralytic polio cases, with no age-weighting, were used. The measure was derived from the World Bank and United Nations reports. A societal willingness-to-pay per paralytic polio case was obtained from the literature.

Measure of benefit:
DALYs and paralytic polio cases prevented were the benefit measures.

Cost data:
The direct costs were those relating to the treatment of paralytic polio cases; establishment of a global monovalent OPV stockpile; maintenance of the global polio laboratory network; maintenance of high-level containment; and achievement
of population immunity at the end of routine vaccination with OPV. The treatment costs were derived from published studies and the data on these costs were limited (see Duintjer Tebbens et al in Other Publications of Related Interest). As these costs could be incurred over a 20-year period, future costs were discounted at an annual rate of 3%. All costs were adjusted to 2002 prices using the consumer price index and they were reported in US dollars ($).

Analysis of uncertainty:
All costs and outcomes were reported for low, lower-middle, upper-middle, and high-income countries. A probabilistic sensitivity analysis was undertaken by fitting distributions around each model parameter, and then performing 10,000 iterations. An additional paper addressing uncertainty issues arising from this research has also been published (Radboud et al 2008, see ‘Other publications of related interest’ below for bibliographic details).

Results
The total costs and outcomes generated by each intervention were not reported. The authors have since stated that these have been published elsewhere (see Thompson and Duintjer Tebbens in Other Publications of Related Interest). They were combined into incremental costs per DALY averted and incremental net benefits.

No routine vaccination was dominant (i.e. it was less costly and more effective) and generated incremental net benefits, compared with OPV, for low, lower middle, and upper middle-income country groups.

Compared with OPV without supplementary immunisation activities (SIAs), IPV had a cost per DALY averted of $3,800 in low-income countries, $80,000 in lower-middle income countries and $440,000 in upper-middle income countries. The net benefit analysis showed that the intervention generated net monetary losses in each of the income groups.

Compared with OPV with SIAs, IPV had a cost per DALY averted of $9,000 in low-income countries, generating a net monetary loss. For lower-middle and upper-middle income countries, the intervention was dominant and generated net monetary gains.

Compared with no routine vaccination, IPV had a cost per DALY averted of $58,000 in low-income countries and $650,000 in lower-middle income countries. For upper-middle income countries, IPV was dominated. In all countries, IPV was associated with net monetary losses compared with no vaccination.

Compared with OPV with SIAs, OPV without SIAs had a cost per DALY averted of $2,800 in low-income countries and $230,000 in lower-middle income countries. For upper-middle income countries, OPV without SIAs was dominated. In all countries, it was associated with net monetary losses, compared with OPV with SIAs.

The details of the uncertainty around these estimates were not reported, but were available from the authors on request.

Authors' conclusions
The authors concluded that: “For low-, lower middle-, and upper middle-income groups currently using OPV, we find that after successful eradication of wild polioviruses, OPV cessation will save both costs and lives when compared to continued use of OPV without supplemental immunization activities (SIAs). We find relatively high (i.e., less desirable) cost-effectiveness ratios for switching from OPV to IPV compared to other health investment opportunities, depending on the actual IPV costs and assumptions about whether SIAs with OPV would continue.”

CRD commentary
Interventions:
The interventions were reported clearly and in detail.

Effectiveness/benefits:
Very few details were reported on how the clinical and effectiveness estimates were obtained. The authors, for example, did not report if a systematic review of the literature was undertaken to identify all relevant information. As a result, it is not clear if all the relevant data were included. The authors have since stated that this information was excluded due to the space constraints of the journal. See Other Publications of Related Interest. As their study was of a
global nature, the authors used DALYs as their measure of outcome as recommended by the World Health Organization and other international agencies.

Costs:
The perspective was not explicitly reported, but the authors did not include indirect costs and only included the costs for the treatment of polio and for the vaccination programmes. The authors reported that global data on costs were very limited. The price year, time horizon, currency, and discount rate were all appropriately reported.

Analysis and results:
The relevant details of the model were reported, with a diagram. Although probabilistic sensitivity analyses were undertaken, the results were not fully reported and the authors stated that further details would be given on request. The authors have since stated that the probabilistic sensitivity analysis was reported in another paper. In their discussion, the authors addressed the limitations of their study in great detail, with the main limitation being the limited data available.

Concluding remarks:
Overall the methodology was adequate, but the authors did not provide any details of the methods of their literature review. The results were reported adequately and the authors’ conclusions appear to be appropriate.

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Other publications of related interest


Duintjer Tebbens RJ, Sangrujee N, Thompson KM. The costs of polio risk management policies after eradication. Risk Analysis 2006; 26:1507-1531.


Sangrujee N, Duintjer Tebbens RJ, Cáceres VM, Thompson KM. Policy decision options during the first 5 years following certification of polio eradication. Medscape General Medicine 2003; 5:35.


**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
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