Costs and benefits of polio eradication: a long-run global perspective
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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.

Health technology
A routine polio immunisation programme (vaccination and eradication) was examined in six geographic regions of the world. The regions were Africa (AFR), the Americas (AMR), eastern Mediterranean (EMR), Europe (EUR), south-east Asia (SEAR) and western Pacific (WPR).

Type of intervention
Primary prevention and treatment.

Economic study type
Cost-utility analysis.

Study population
The study population appears to have been all children under 5 years of age.

Setting
The setting was not stated. The economic study was carried out in the USA and France.

Dates to which data relate
The effectiveness data were obtained from studies published between 1969 and 1976. The cost and resource use data were obtained from studies published between 1994 and 2000. The price year was 2000.

Source of effectiveness data
The effectiveness evidence was derived from published studies.

Modelling
A time series modelling approach was used to project the polio incidence rates from 1970 to 2050. The steps of the analytic model were described. It was assumed that immunisation was discontinued after 2010. Data referring to the pre-immunisation period were derived from US and Italian databases, due to the lack of reliable data for other regions of the world.

Outcomes assessed in the review
The outcomes assessed from the published studies were:

the proportion of polio cases becoming paralysed;

the proportion of polio cases with nervous system attack (NSA), but not paralysed;
the duration of paralysis;
the disability weight;
the case fatality rate per 100 of paralysis and central NSAs; and
the years of life lost due to premature death per case.

**Study designs and other criteria for inclusion in the review**
A formal review of the literature was not undertaken. The design of the primary studies was not reported.

**Sources searched to identify primary studies**
Not stated.

**Criteria used to ensure the validity of primary studies**
Not stated.

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

**Number of primary studies included**
The effectiveness evidence was obtained from three primary studies.

**Methods of combining primary studies**
Not stated.

**Investigation of differences between primary studies**
Not stated.

**Results of the review**
The proportion of polio cases becoming paralysed was 0.1027.

The proportion of polio cases with NSA, but not paralysed, was 0.1053.

The duration of paralysis was 67 years.

The disability weight used in the analysis was 0.369.

The case fatality rate per 100 of paralysis and central NSAs was 10.

The years of life lost due to premature death per case were 70.

**Measure of benefits used in the economic analysis**
The summary benefit measure used in the economic analysis was the number of disability-adjusted life-years (DALYs) lost due to polio cases. The disability weight was based on an estimate made by the World Health Organisation (WHO).

A 5% discount rate was used as future benefits were evaluated. The numbers of polio cases and deaths prevented were also reported.
Direct costs
The costs were discounted at an annual rate of 5%, because of the long time horizon of the analysis. The unit costs were reported, but the quantities of resources were not. The health services included in the economic evaluation were routine vaccination, eradication and the treatment of polio cases. The cost/resource boundary adopted in the study was that of the health service provider. The costs and resource use data were based on data estimated by the WHO and other published studies. The costs were calculated for low, middle, upper-middle and high-income countries, and then weighted using the proportion of population in these categories for each of the six regions of the world considered in the study. The price year was 2000.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The indirect costs were not considered.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analyses were not performed.

Estimated benefits used in the economic analysis
The overall number of polio cases prevented because of the polio immunisation programme (all six regions included) was 41.73 million.

The overall number of deaths prevented was 855,000.

The number of DALYs saved was 39,415,000 by routine vaccination and 198,000 by eradication.

Cost results
The overall immunisation costs were $67,009 million, while the eradication costs were $5,933 million.

Overall, assuming that immunisation was discontinued after 2010, the medical care costs saved were $128,120 million by routine vaccination and $454 million by eradication.

Synthesis of costs and benefits
An incremental analysis was carried out to combine the costs and benefits of the study interventions.

Considering each world region separately, the cost per DALY saved was a negative figure in EUR and AMR, meaning that the programme was cost-saving and more effective (it dominated no immunisation).

The cost per DALY saved was $442 in AFR, $426 in EMR, $1,041 in SEAR and $356 in WPR.

Overall, the polio immunisation programme was cost-saving.

Authors' conclusions
The polio immunisation programme was cost-saving for high-income regions of the world, such as Europe and America. However, it was quite expensive for developing countries, which may decide not to promote the implementation of such a programme.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. No intervention was selected as the basic comparator since the aim of the study was to evaluate the additional value of the immunisation programme. In addition, no intervention represented the actual policy in several countries.

Validity of estimate of measure of effectiveness
The effectiveness evidence was obtained from published studies. However, a formal review of the literature was not undertaken and the design of the primary studies was not reported. Each study provided evidence on specific outcomes, which were not combined. The authors did not discuss the quality of the primary studies or the data extraction approach. The data referred to Italy and USA, and were then extrapolated to the remaining countries. The uncertainty in the estimates used was not investigated and this is likely to have affected the external validity of the analysis.

Validity of estimate of measure of benefit
The benefit measure used in the economic analysis represents a typical measure used in studies evaluating health interventions that have an impact on survival and disability. Caution is required when comparing the present benefit measure with other benefit measures, such as quality-adjusted life-years, which are more widely used in the economic evaluations carried out in developed countries alone.

Validity of estimate of costs
The analysis of costs was performed from the perspective of the national health services paying for the immunisation programme. It appears that all the relevant categories of costs have been included in the analysis. Resource use data were taken from published studies but details on resource consumption were not reported. The unit cost of the vaccine was provided and the price year was reported. This makes reflation exercises in other settings feasible. The cost data were based on data analysed by the WHO.

Other issues
The authors did not compare their findings with those from other studies. They also did not perform any sensitivity analyses to investigate the uncertainty in the data used in the analysis. Most of the data on the pre-vaccination period came from two countries (Italy and USA) and were then extrapolated to the other regions. This may have led to some unreliable estimates being used in the model.

Implications of the study
The study results suggest that developed countries should support the implementation of polio immunisation programmes in the developing regions of the world, because it represents a good economic investment. The authors note that "allocating only 10% of the net savings of high-income countries will help to fund 20% of polio vaccination costs in the developing world".

Source of funding
None stated.

Bibliographic details