Cost benefit analysis of Japanese encephalitis vaccination program in Thailand

Siraprapasiri T, Sawaddiwudhipong W, Rojanasuphot S

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
Administering the Japanese encephalitis (JE) vaccination to children aged 18 months (given concurrently with the 4th dose of DTP, while the second dose administration would happen 1-2 weeks later) and 6 years (concurrently with the routine school immunisation programme).

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Children aged 18 months and 6 years.

Setting
Primary care and the community. The economic study was carried out in Thailand.

Dates to which data relate
Effectiveness data were based on literature published between 1988 and 1994. Resource use data and their collection dates were not reported. The price year was 1995.

Source of effectiveness data
Effectiveness information was derived from a literature review and assumptions made by the authors.

Modelling
A decision tree was developed to estimates the costs and benefits associated with each strategy.

Outcomes assessed in the review
The following outcomes were assessed: the efficacy of two doses of JE vaccine; natural immunity at 18 months and at 6 years; JE incidence rate at 18 months and 6 years; percentage of deaths, severe disability, mild disability, and full recovery following the incidence of clinical JE illness; and complications due to the JE vaccine.

Study designs and other criteria for inclusion in the review
A double blind field study of two doses of JE vaccine in Thailand was noted; no further information was given.
Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

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

Number of primary studies included
A total of 4 studies were included.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported.

Results of the review
The probability values were as follows:

- efficacy of two doses of JE vaccine, 91%;
- natural immunity at 18 months, 5%;
- natural immunity at 6 years, 30%;
- annual JE incidence rate at 18 months, 15 cases per 100,000;
- annual JE incidence rate at 6 years, 18 cases per 100,000;
- death following the incidence of clinical JE illness, 25%;
- severe disability following the incidence of clinical JE illness, 15%;
- mild disability following the incidence of clinical JE illness, 25%;
- full recovery following the incidence of clinical JE illness, 35%.

Complications due to the JE vaccine were reported to be minor and confined to local reactions.

Methods used to derive estimates of effectiveness
The authors also made assumptions about effectiveness.

Estimates of effectiveness and key assumptions
It was assumed that the quality of life for children with moderate disability was 80% that of normal children.
Measure of benefits used in the economic analysis
The number of JE cases prevented per 100,000 population was used as the main benefit measure. In addition, cases of death prevented, cases of severe disability prevented, and cases of moderate disability prevented were also reported.

Direct costs
Costs were discounted. Quantities were reported separately from the costs and cost items were reported separately. Cost analysis covered the costs of JE vaccination (including wastage, and supplies) and savings associated with the cases of JE prevented (including the savings due to the treatment of acute JE illness, savings due to the prevention of death, and savings due to prevention of mental retardation). The perspective adopted in the cost analysis was that of a public health system. The sources of data for the cost of JE treatment and the cost of severe neurological deficit care were studies published in 1988 and 1995. The cost of mortality was calculated based on the human capital approach. Expected gross national per capita income during ages 18-60 years was used to calculate the future lifetime earnings. The date of the price data was 1995. The cost analysis did not cover the building and cold chain costs (since they were already in use in routine immunisation programme) as well as the cost of vaccine complications (these were minor and confined to local reactions).

Indirect Costs
Indirect costs were not considered.

Currency
US dollars ($).

Sensitivity analysis
To tackle the uncertainties associated with the parameter estimates, a set of two-way sensitivity analyses was performed on the incidence of JE and cost of vaccine, as the chief parameters affecting the cost-effectiveness results.

Estimated benefits used in the economic analysis
The number of JE cases prevented per 100,000 population due to the JE vaccination was 123.7 for the 18-month-child programme compared to 152.9 for the 6-year-child programme. For the 18-month-child programme, 31 deaths were prevented, 19 cases of severe disability were prevented, and 31 cases of moderate disability were prevented.

Cost results
The 18-month-child programme was associated with an overall cost of programme of $1,944,000 and cost savings of $9,020,451. This produced a net cost saving of $7,076,451 and a cost-saving-to-cost ratio of 4.6. The 6-year-child programme cost $3,528,000, saved $10,121,521, gave a net saving of $6,593,521, and a cost-to-saving ration of 2.87. The discount rate was 5%.

Synthesis of costs and benefits
The calculation of a cost-effectiveness ratio was not required since both interventions were associated with net savings. However, the authors calculated the ratio of programme cost per case of JE prevented as the cost-effectiveness ratio, yielding values of $15,715 for the 18-month-child programme and $21,661 for the 6-year-child programme. The sensitivity analysis established that the vaccination programmes were economically viable options unless the JE incidence was reduced to 3 per 100,000 population.

Authors' conclusions
At the present cost of vaccine, JE vaccine is a cost beneficial intervention. Children under 3 years of age should be the first priority because of the greater cost-effectiveness. The JE vaccination is also a worthy prevention programme for
school children in high risk areas where the incidence of JE is more than 5/100,000 population.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of the comparator is clear.

**Validity of estimate of measure of benefit**
The internal validity of the effectiveness results cannot be assured due to the apparent lack of both a systematic literature search and quality assessment of the primary studies included in the review. A decision tree model was used to estimate the benefits of the programmes for 1,000,000 children with a coverage of 90%.

**Validity of estimate of costs**
Quantities and costs were reported separately and adequate details of methods of cost estimation were given. The cost results refer to Thailand and may not be generalisable to other settings or countries. Also, a 5% discount rate was applied, which might differ from the rates used in other countries.

**Other issues**
Given the apparent lack of a systematic literature review and comprehensive sensitivity analyses, the study results may need to be treated with some caution. The issue of generalisability was partially addressed in the sensitivity analyses on the JE incidence and cost of vaccination. Some comparisons were made with other studies.

**Source of funding**
Supported by the International Development Research Center (IDRC), Canada.

**Bibliographic details**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Child; Child, Preschool; Cost-Benefit Analysis; Developing Countries; Encephalitis Virus, Japanese /immunology; Encephalitis, Japanese /economics /immunology /prevention & control; Female; Humans; Immunization Programs /economics; Immunization Schedule; Infant; Male; Research Support, Non-U.S. Gov't; Thailand; Viral Vaccines /administration & dosage /economics /immunology

**AccessionNumber**
21998006008

**Date bibliographic record published**
31/05/2001

**Date abstract record published**
31/05/2001