Cost-effectiveness of influenza vaccination of healthy children
Salo H, Kilpi T, Sintonen H, Linna M, Peltola V, Heikkinen T

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
The study examined the influenza vaccination of children aged between 6 months and 13 years of age in Finland.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The hypothetical study population comprised annual age cohorts of children from 6 months to 13 years of age.

Setting
The setting was the community. The economic study was carried out in Finland.

Dates to which data relate
The effectiveness data related to 1988 to 2004 and the cost data to 1982 to 2005. The price year was 2004.

Source of effectiveness data
The effectiveness data were derived from a review of published studies.

Modelling
A decision tree was used to estimate the costs and health outcomes associated with vaccination and no vaccination. All vaccination-related costs and benefits were assumed to occur during the corresponding influenza season.

Outcomes assessed in the review
The outcomes assessed included

the incidence of influenza,

the rates of influenza-associated complications,

annual basic mortality, and

the efficacy of influenza vaccination.
Study designs and other criteria for inclusion in the review
Not reported.

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
The review included 12 primary studies.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported.

Results of the review
The efficacy of the vaccine against influenza was 80%.

Among approximately 756,000 children aged between 6 months and 13 years in Finland, 121,885 cases of symptomatic influenza would occur annually.

The probability of the influenza-associated complication acute otitis media (AOM) was 0.56.

Methods used to derive estimates of effectiveness
The authors made various assumptions to support their analysis.

Estimates of effectiveness and key assumptions
The authors assumed that the rates of complications and severe illnesses in influenza-infected children were similar in both arms (vaccination and no vaccination).

The actual number of influenza-infected children seen at an emergency department but not admitted to the ward was assumed to be twice that of the virologically confirmed cases.

The efficacy of the vaccine against influenza was assumed to be 80% in the base-case.

Measure of benefits used in the economic analysis
No summary measure of health benefit was used in the cost-effectiveness analysis. In effect, a cost-consequences analysis was performed.
Direct costs
The study included the direct costs to the health service and to the patients' families. These covered the costs of primary care visits, inpatient stay, attendances at accident and emergency departments, antibiotics for bacterial infections, otological surgery, travel, and the vaccine and its administration. The authors excluded all costs of drugs used for the symptomatic treatment of influenza. The unit costs were reported separately from the resource use quantities. Medication costs were based on retail prices without value added tax, while vaccine costs were based on wholesale prices. The costs of hospital stay for influenza were derived from the Health Care Register and the National Research and Development Centre for Welfare and Health (STAKES). Travel costs and remaining health service costs were based on published studies. Discounting was not relevant as the time horizon for the study was one influenza season. The price year was 2004.

Statistical analysis of costs
Individual sampled data were not available for statistical analysis.

Indirect Costs
The study included the productivity loss associated with parental absenteeism from work because of influenza in children and as a result of taking children to receive vaccination. Productivity costs were valued using the human capital approach and using the average gross income of Finnish employees. The authors assumed that 65% of children were cared for at home by their mothers, thus parental absenteeism from work would occur in only 35% of cases.

Currency
Euros (EUR).

Sensitivity analysis
The authors stated that they performed several one-way sensitivity analyses to examine the effects of uncertainty in the key parameters of the model. They performed a threshold analysis for the price of the vaccine. A full probabilistic analysis was also undertaken, with beta distributions used to characterise the uncertainty around probabilities and lognormal distributions used to characterise uncertainty around cost parameters. The authors stated that the parameters for the distributions were estimated from "patient level cost data", although the source of these data was not specified.

Estimated benefits used in the economic analysis
Among 140,000 children aged between 6 months and 5 years, a vaccination programme was estimated to prevent 36,069 cases of influenza, 11,916 cases of AOM, 896 cases of sinusitis and 1,050 cases of outpatient pneumonia.

Among the 756,000 children aged between 6 months and 13 years, a vaccination programme was estimated to prevent 97,508 cases of influenza.

Cost results
The vaccination programme was estimated to be cost-saving in all age groups.

For the 756,000 children aged between 6 months and 13 years, the vaccination programme cost EUR 4,383,477 in terms of medical costs, EUR 4,534,266 in terms of travel costs, and EUR 11,144,095 in terms of productivity costs.

The total savings in terms of influenza-related costs (direct and indirect) were EUR 31,117,663. Thus, the net savings of the vaccination programme were EUR 11,055,825 for children aged between 6 months and 13 years, or EUR 14.6 per child, from a societal perspective.

The net savings of the vaccination programme in terms of direct costs only were EUR 485,067, or EUR 0.64 per child aged between 6 months and 13 years.
The probabilistic sensitivity analysis indicated that the 95% confidence intervals for savings per vaccinated child were EUR 3.6 to 28.7 for children younger than 3 years, EUR 3.5 to 25.2 for children younger than 5 years, and EUR 2.9 to 22.4 for children younger than 7 years.

**Synthesis of costs and benefits**
Not relevant.

**Authors' conclusions**
The results of the study provided considerable evidence in favour of the influenza vaccination of healthy children.

**CRD COMMENTARY - Selection of comparators**
The comparators were selected by looking at current practice in the study setting and comparing it against vaccination programmes for healthy children that were in place in several other countries. Much of the data were chosen to be specific to the study setting of Finland. You must consider whether the results of this study would be applicable to your own setting.

**Validity of estimate of measure of effectiveness**
The estimate of effectiveness was derived from a review of published studies, but the authors did not state whether a systematic review of the literature had been undertaken. Since the authors did not report the methods used to combine data from the primary studies, they could have used data from the available studies selectively. It was unclear whether the estimation of vaccine effectiveness was allowed to vary in the full probabilistic sensitivity analysis. The authors did not consider the impact of differences between the primary studies when estimating effectiveness.

**Validity of estimate of measure of benefit**
The authors did not derive a summary measure of health benefit. The study was therefore categorised as a cost-consequences analysis.

**Validity of estimate of costs**
The authors included all relevant categories of cost for the perspective adopted, including indirect costs appropriate to the societal perspective. The authors excluded the costs of drugs used for the symptomatic treatment of influenza from the analysis. This represents a conservative assumption with respect to the vaccination programme, as fewer influenza infections would have occurred under vaccination. The costs and the quantities were reported separately. The resource use estimates were taken from published sources and national databases. The uncertainty around the cost estimates was examined in a full probabilistic sensitivity analysis, although the ranges tested were not reported. Prices were taken from public pricing lists and national databases in the authors' setting. A threshold analysis was performed around the wholesale price of the vaccine. The date to which the prices related was reported.

**Other issues**
The authors did not compare their findings with those from other studies. They stated that the results of their study would not be directly generalisable to other countries. The authors did not present their results selectively and their conclusions reflected the scope of the analysis. The authors reported that the efficacy of the influenza vaccine had been poorly determined.

**Implications of the study**
The authors recommend that similar cost-effectiveness studies should be conducted in all countries.
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Other publications of related interest
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Indexing Status
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