Cost-effectiveness analysis of inactivated virosomal subunit influenza vaccination in children aged 3-14 years from the provider and societal perspectives

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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
The study compared universal vaccination of children aged 3 to 14 years using a single dose of inactivated virosomal subunit influenza vaccine with no routine vaccination.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis and cost-utility analysis.

Study population
The study population comprised a hypothetical cohort of 1,000 preschool and school aged children (i.e. 3 to 14 years) in Catalonia, Spain.

Setting
The study setting was primary care. The study was conducted in Spain.

Dates to which data relate
The effectiveness data were derived from studies published in 2005 and 2006. The price year was 2006.

Source of effectiveness data
The data used in the economic evaluation included:

- the incidence of health events related to influenza virus infections (i.e. acute febrile respiratory processes, hospitalisations and deaths); and

- the effectiveness of the vaccination programme in reducing these events.

Modelling
A decision tree analytic model was used to analyse the disease evolution with and without the vaccination programme. The time horizon of the programme was 6 months.

Sources searched to identify primary studies
The incidence of acute febrile respiratory processes and the effectiveness of the vaccination programme were derived from a prospective cohort study in healthy children aged 3 to 14 years attending private paediatric clinics in Barcelona,
Methods used to judge relevance and validity, and for extracting data
The majority of the effectiveness data were derived from the prospective study (Salleras et al. 2006), which was carried out by the same group of authors as in the present study. No further details were reported on how other studies, which also provided data for the model, were obtained. A synthesis of the data was not required as data for each parameter were derived from a single study for each one.

Measure of benefits used in the economic analysis
The measures of benefits used were the number of acute febrile respiratory processes (both episodes and hospitalisations) avoided and the quality-adjusted life-years (QALYs) gained. The authors provided no details on how QALYs were constructed or from which sources the utility values were derived.

Direct costs
The direct costs included in the analysis were those to the health care system. These comprised the costs of the vaccination programme (i.e. vaccine, administration and adverse effects), medical consultations in primary health care centres (i.e. medical visits, antibiotic and antipyretic consumption), hospitalisation in a paediatric hospital, and the direct non-medical costs of transport for outpatients visit and to hospital. All resource use data, apart from the hospitalisation rate, were derived from the same prospective cohort study that provided much of the information for the effectiveness study (Salleras et al. 2006). The unit costs for medical consultations and hospitalisation were obtained from the tariff of prices published by the Catalan Health Service and the estimates made by the Paediatric Primary Health Care Group. Since the costs were incurred during 6 months, discounting was not relevant and was appropriately not performed. The study reported the total costs. The price year was 2006.

Statistical analysis of costs
The costs were reported as point estimates (i.e. the data were deterministic).

Indirect Costs
The indirect costs included in the analysis were the losses due to the mother taking care of the sick child and the working life lost by the child due to premature death. Productivity costs were calculated using the human capital approach. These consisted of two elements: the days of work lost by the mother and the years of work lost by the dead child, and the average daily salary weighted by the rate of economic activity. Since productivity losses would be incurred over many years, discounting was relevant and was appropriately performed at an annual rate of 5%.

Currency
Euros (EUR).

Sensitivity analysis
A series of one-way sensitivity analyses was performed by varying the parameters that could vary widely because of the uncertainty in their value. These included the price of vaccines, costs of vaccine administration, hospitalisation rates, days of hospitalisation, mortality rates and cost of work absenteeism.

Estimated benefits used in the economic analysis
For a hypothetical cohort of 1,000 children, the number of acute febrile respiratory episodes was 429.4 with no
vaccination compared with 177.8 with vaccination.

For a hypothetical cohort of 1,000 children, the number of hospitalisations was 0.3 with no vaccination compared with 0.1242 with vaccination.

For a hypothetical cohort of 1,000 children, the number of deaths was 0.002 with no vaccination compared with 0.00083 with vaccination.

The authors did not report the QALYs gained per intervention.

**Cost results**
From a health care system perspective, the total costs were EUR 19,262.93 in the no vaccination group compared with EUR 20,723.44 in the vaccination group.

From a societal perspective, the total costs were EUR 42,794.16 in the no vaccination group compared with EUR 35,207.13 in the vaccination group.

**Synthesis of costs and benefits**
The costs and benefits were combined using an incremental cost-effectiveness ratio (i.e. the additional cost per acute febrile respiratory process prevented) and an incremental cost-utility ratio (i.e. the additional cost per QALY gained).

From a health care system perspective, when vaccination was compared with no vaccination, the cost per acute febrile respiratory process avoided was EUR 5.80 and the cost per QALY gained was EUR 18.26.

From a societal perspective, vaccination was found to be dominant (i.e. it was both more effective and less costly than no vaccination).

The one-way sensitivity analyses showed that the results were most sensitive to the price of the vaccine and the cost of work absenteeism.

**Authors' conclusions**
Vaccinating 3- to 14-year-old children with a single dose of inactivated subunit influenza vaccine in primary health care centres generated benefits to society in addition to substantial health benefits to the child.

**CRD COMMENTARY - Selection of comparators**
Although no explicit justification was given for using no vaccination as the comparator, it would appear to represent current practice in the authors' settings. You should decide if the comparator used represents current practice in your own setting.

**Validity of estimate of measure of effectiveness**
The parameters used in the model were derived from published literature, with the majority of the effectiveness data being derived from the prospective study (Salleras et al. 2006) that was carried out by the same group of authors as in the present study. The authors provided very few details of this study, and of the other studies included in the review. Consequently, it is not possible from the information provided in this paper to objectively assess the internal and external generalisability of the authors' results.

**Validity of estimate of measure of benefit**
The estimation of benefits was derived from the decision tree model. Although the authors reported an incremental cost-utility ratio, it was unclear how the QALYs were constructed, as no mention was made in the 'Methods' section of the article and the authors did not report the disaggregated QALYs per intervention group.
Validity of estimate of costs
The analysis of the costs was performed from the perspectives of the health care service and society. Given these two perspectives, all relevant cost categories appear to have been included and no major relevant costs appear to have been omitted. The authors excluded the indirect costs of maternal occupational absenteeism for accompanying the child on a paediatric visit and the direct non-medical cost of transport to the primary care centre for vaccination, as the vaccine was considered to be administered during a routine annual health examination. This exclusion was relevant and therefore did not bias the results of the study. All resource use data, apart from the hospitalisation rate, were derived from the same prospective cohort study that provided much of the information for the effectiveness study. The unit costs were taken from the tariff of prices published by the Catalan Health Service and the estimates made by an expert group. Only productivity costs were discounted since these were the only costs that could be incurred over more than one year. The costs were reported separately from resource use, which will enhance the generalisability of the authors' results. The price year was reported, which will aid any future inflation exercises.

Other issues
The authors reported that their results were similar to those of other economic evaluations of inactivated influenza vaccines that had adopted a societal perspective. The issue of generalisability to other settings was partly addressed in the limited sensitivity analyses performed. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis. However, it would have been helpful had the method used to generate QALYs been more clearly reported. The authors reported a further limitation to their study in that their results could not be extrapolated to other countries with differing antibiotic, vaccine prices and costs.

Implications of the study
The authors reported that their results could be useful to Catalan health authorities when deciding whether to introduce paediatric influenza vaccination.

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Other publications of related interest
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**Indexing Status**
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