Economics of an adolescent meningococcal conjugate vaccination catch-up campaign in the United States


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
This study examined the cost-effectiveness of a one-time catch-up vaccination programme, using a quadrivalent meningococcal conjugate vaccine, for children and adolescents aged 11 to 17 years, considering both the direct and herd immunity benefits. The authors concluded that, although costly, catch-up vaccination could have a substantial impact on the burden of meningococcal disease. The study was well conducted, but the data sources were not extensively described. The authors’ conclusions appear to be robust, as shown by the sensitivity analyses.

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

Study objective
This study examined the cost-effectiveness of a one-time catch-up vaccination campaign using a quadrivalent meningococcal conjugate vaccine for children and adolescents aged 11 to 17 years, considering both the direct and herd immunity benefits of vaccination compared with no vaccination.

Interventions
The catch-up vaccination strategy was followed by routine annual immunisation of each child aged 11 years. This strategy was compared with a no catch-up strategy.

Location/setting
USA/primary care.

Methods
Analytical approach:
This economic evaluation was based on a probabilistic model with a lifetime horizon, although the catch-up vaccination programme was assumed to have a duration of 10 years. The authors stated that the analysis was conducted from the perspective of both society and the public medical payer.

Effectiveness data:
The clinical data came from a selection of known relevant published studies. The key data on the incidence of disease and mortality risk following meningococcal disease came from the Active Bacterial Core surveillance database, which covered the period from 1991 to 2002. Other data came from other published studies, the details of which were not given. The primary clinical endpoint was the vaccine efficacy, which was taken from UK studies. UK studies were also used to estimate the vaccine benefits in terms of herd immunity. A few assumptions were also made.

Monetary benefit and utility valuations:
Decreases in the quality of life among survivors of meningococcal disease, with long-term after effects, were derived from studies that reported the utility scores for conditions, which closely resembled each of the meningococcal disease-related sequelae. Several instruments were used in these studies to elicit the preferences, including the European Quality of life (EQ-5D), the Utility Health Index, and the Short Form (SF-36). Other details were not provided.

Measure of benefit:
The summary benefit measures were the cases averted, deaths averted, life-years (LYs), and quality-adjusted life-years
(QALYs). An annual discount rate of 3% was applied.

Cost data:
The economic analysis included vaccination costs and those associated with the treatment of meningococcal disease (both in the acute phase and long-term management). The direct medical and non-medical, and indirect costs were included. The costs of disease were derived from published sources. The cost of vaccination and vaccine wastage was based on authors’ assumptions. These costs were reported as macro-categories. They were in US dollars ($) and were discounted at an annual rate of 3%. The price year was 2005.

Analysis of uncertainty:
A probabilistic sensitivity analysis was carried out on the values and distributions of inputs. The model was replicated by varying the cost of vaccination and the effect of herd immunity. Alternative scenarios of high-incidence areas were considered. The cost-effectiveness and cost-utility ratios were also calculated excluding the productivity losses attributable to death.

Results
In the entire US population, a 10-year immunisation strategy led to a reduction of 8,251 cases of meningococcal disease and 698 deaths and a discounted gain of 15,264 LYs and 27,150 QALYs.

The vaccination strategy was associated with additional costs of $1,797 million (assuming a cost of $83 per vaccinee) from the perspective of society, and $2,717 from the perspective of the public medical payer.

The incremental cost per LY saved with vaccination was $147,000 from the perspective of the payer and $127,000 from the societal perspective. The incremental cost per QALY gained (only from a societal perspective) was $88,000 and in the high endemicity scenario it was $33,000.

Only at a cost of $20 per vaccinee ($83 in the base case), did vaccination become cost-saving from a societal perspective. Changes in the other model inputs altered the study findings in the expected directions: for example, an increase in vaccine price worsened the cost-effectiveness ratios.

Authors’ conclusions
The authors concluded that, although costly, catch-up vaccination of adolescents could have a substantial impact on the burden of meningococcal disease. Targeting counties with a high incidence of disease decreased the cost per LY saved by two-thirds.

CRD commentary
Interventions:
The comparator, which was no vaccination, was appropriate for reflecting the current pattern of care in the authors’ setting. It was also valid for determining the active impact of vaccination in adolescents.

Effectiveness/benefits:
The data sources appear to have been selected from those known to the authors, as no details of the methods and conduct of a literature review were provided. Except for an official database, no information on the sources of data was given, which makes an objective assessment of the validity of the clinical inputs impossible. Most of the data on vaccine efficacy were taken from UK studies and then applied to the USA. Extensive sensitivity analyses were conducted to address this issue. The utility estimates were taken from published studies which used appropriate instruments, but few details of these studies were reported. In general, QALYs and LYs are valid benefit measures, because they capture the burden of disease on patients’ health and can also be compared with the benefits of other health care interventions. Disease-specific measures were also reported.

Costs:
The categories of costs were consistent with the perspectives. However, the costs were reported as macro-categories and were not broken down into individual items, which would have been useful for improving the transparency of the economic study. The sources of economic data were not clearly described and the methodological approach used to
calculate the total costs was not clear. Details on the quantities of resources used were not reported. Other aspects of the economic analysis such as the price year, the use of discounting, and type of sensitivity analysis, were provided.

**Analysis and results:**
The use of an incremental approach to synthesise the costs and benefits was appropriate. The expected costs, benefits, and incremental ratios were reported in detail. The issue of uncertainty was appropriately investigated and appropriate alternative scenarios were considered and extensively described. The authors made detailed comparisons of their findings with those from other studies.

**Concluding remarks:**
In general, the study was well conducted, but the data sources were not extensively described. The authors’ conclusions appear to be robust, as shown by the sensitivity analyses.

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