Cost-effectiveness of nationwide hepatitis B catch-up vaccination among children and adolescents in China

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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.

CRD summary
This study evaluated the costs and health effects of a nationwide catch-up programme of vaccination against hepatitis B virus, in China, for unvaccinated children and adolescents aged one to 19 years. The authors concluded that a nationwide free catch-up vaccination programme was likely to be cost-saving and feasible. Despite some limitations, the methods were appropriate and comprehensive and the conclusions reached by the authors appear to be appropriate.

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

Study objective
The objective was to evaluate the costs and health effects of a nationwide catch-up programme of vaccination against hepatitis B virus, in China. The study population was a hypothetical cohort of 10,000 unvaccinated children and adolescents aged one to 19 years.

Interventions
Catch-up hepatitis B vaccination, in three doses, for children and adolescents who had missed the newborn vaccination, was compared with the status quo, which was no catch-up programme and unchanged vaccination coverage. It was assumed that 0.5% of all the children who were not vaccinated would choose to have the vaccine, each year in the future.

Location/setting
China/primary care.

Methods
Analytical approach:
A probability tree was used to evaluate the outcomes of acute hepatitis B virus infection. A Markov model was also used to synthesise the published data from scientific literature and other sources and to project the costs and health outcomes of treated and untreated chronic hepatitis B virus infection. The analysis had a lifetime horizon and the authors stated that they took a societal perspective.

Effectiveness data:
The clinical data for vaccine effectiveness and hepatitis B virus progression were from a selection of relevant published studies that had Chinese populations, where available, from government statistics, and from authors' assumptions. Expert opinion was sought from the Chinese Centre for Disease Control and Prevention and from other health organisations. The prevalence of hepatitis B virus infection was based on a 2006 national serological survey of 80,000 Chinese people. Other clinical outcomes included acute and chronic hepatitis B virus infections, cirrhosis with sequelae, mortality, and liver transplants.

Monetary benefit and utility valuations:
The health state values were from published studies.

Measure of benefit:
The measures of benefit were quality-adjusted life-years (QALYs), hepatitis B virus infections averted, and deaths.
Discounting was applied at an annual rate of 3%.

Cost data:
The direct medical costs were included for the vaccine and its administration per dose, health care for acute symptomatic infection and side-effects, chronic health care including hospitalisations for cirrhosis, and liver transplantation. The programme implementation costs were assumed to be similar to those for a recently adopted school-based vaccination programme. The unit costs were from a selection of relevant published sources, government departments, and personal communications with experts. They were discounted at a rate of 3% and converted to 2008 US dollars ($).

Analysis of uncertainty:
The uncertainty was measured in one-way sensitivity analyses, on all the model parameters, and a probabilistic sensitivity analysis, with Monte Carlo simulations. Uniform distributions, between low and high values, were assigned to all the parameters. Two-way sensitivity analyses, varying the incidence of acute hepatitis B virus infection and the age of the cohort, were investigated. The results were illustrated in graphs.

Results
Over their remaining lifetime, the vaccination programme for 10,000 children aged one to 19 years, incurred total health costs of $35,798,000 compared with $35,819,000 with no vaccination programme. The programme itself cost $12,000.

With vaccination, a total of 4,339 vaccinations were administered and resulted in 98 acute infections, 4.6 chronic infections, 90 deaths, and 284,239 discounted QALYs. Without vaccination, there were 292 acute infections, 13.7 chronic infections, 91 deaths, and 284,228 discounted QALYs.

There was a 97% likelihood that the vaccination programme was cost-saving, compared with no vaccination, and a 98% chance that the incremental cost-utility ratio was below $2,500 per QALY gained, which was considered to be an acceptable cost-effectiveness threshold, in China. The findings were most sensitive to the cohort age, infection incidence, and vaccination administration cost.

Authors' conclusions
The authors concluded that a nationwide free catch-up vaccination programme for children and adolescents in China was likely to be cost-saving and feasible.

CRD commentary
Interventions:
The vaccination programme and usual care were described, but the details of the vaccine dosing were not given. These options might be feasible in other settings, where a proportion of individuals purchase the vaccine for themselves.

Effectiveness/benefits:
The clinical effectiveness parameters were from available published research trials and a meta-analysis. These sources were clearly reported as were all the assumptions made. The methods used to value the utilities were not stated, but the sources were referenced and can be consulted to assess the quality of these data.

Costs:
A societal perspective was stated, but only the relevant medical resources appear to have been included, without those costs relating to patient time or other third parties, such as productivity losses arising from hepatitis B infections.

Analysis and results:
The authors compared their findings with those for childhood vaccination programmes for other diseases in Asia and suggested that their catch-up programme compared favourably. They acknowledged a number of limitations of their study including the reliance on international studies for their utility estimates and the omission of patient-related time costs. There were relatively small differences in costs and outcomes between the vaccination and no vaccination groups, but the low and high values, used in the sensitivity analyses, were far apart in most instances and, therefore, the analyses
are likely to be conservative.

Concluding remarks:
Despite some limitations, the methods were appropriate and comprehensive. The conclusions reached by the authors appear to be appropriate.

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