The cost-effectiveness of a modestly effective HIV vaccine in the United States

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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 examined the cost-effectiveness of HIV vaccination strategies focusing on adult populations. The authors concluded that a partially effective HIV vaccine would be cost effective. Strategies that prioritised key populations were most efficient but broader strategies provided greater total population health benefit. The conclusions are appropriate within the scope of the analysis undertaken. The limitations of the analysis should be borne in mind.

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

Study objective
To examine the potential cost-effectiveness of HIV vaccination strategies in adult populations.

Interventions
The strategies evaluated were: one-time vaccination; vaccination followed by booster vaccinations at either three- or five-year intervals; and a hybrid strategy in which only high-risk populations received booster vaccinations. Coverage rates considered in the study were 30%, 60% and 90%.

Location/setting
USA/primary care

Methods
Analytical approach:
The analysis was based on a published mathematical model of HIV transmission and disease progression. The time horizon was 10 years. The authors stated that a societal perspective was adopted.

Effectiveness data:
The clinical and epidemiological data were mainly from the original publication of the model (see Other Publications of Related Interest). The vaccine efficacy data and assumptions were based on an randomised controlled trial that evaluated the RV144 vaccination. The key inputs were rate of HIV transmission, HIV disease status, antiretroviral treatment status, HIV vaccination status and risk behaviours.

Monetary benefit and utility valuations:
Utility weights were taken from published sources.

Measure of benefit:
Quality-adjusted life-years (QALYs) and life-years gained were the summary benefit measures and were discounted at an annual rate of 3%.

Cost data:
Costs included vaccine, HIV-related health care, non- HIV-related health care, antiretroviral therapy, counselling, laboratory tests and ancillary services for people who inject drugs. The costs were from published studies. Costs were presented as macro-costs. All costs were in USA dollars ($) and were discounted yearly at a rate of 3%. The price year was 2009.

Analysis of uncertainty:
Several sensitivity analyses were conducted to examine the impact of variations in the clinical and economic inputs on the model outcomes. Best-worst case scenarios were considered along with alternative assumptions about constant compared with waning long-term vaccine efficacy.

**Results**

Three strategies were considered to be potentially cost-effective:

1. One-time targeted vaccination of high risk population (defined as men who have sex with men or persons who inject drugs) with 60% coverage.

2. One-time vaccination of 60% of all adults coupled with three-year boosters only for high-risk populations.

3. One-time vaccination coupled with three-year boosters of 60% of all adults.

Over a 10-year period, strategy 1 prevented 46,000 infections and saved 560,000 life years and 470,000 QALYs, strategy 2 prevented 122,447 infections and saved 1,420,000 life years and 1,190,000 QALYs and strategy 3 prevented 142,742 infections and saved 1,610,000 life years and 1,420,000 QALYs.

Incremental analysis showed that strategy one had an incremental cost-effectiveness ratio of $645,292 compared to strategy two, strategy two was cost-saving compared to no vaccination and strategy three an incremental cost-effectiveness ratio of $81,480 compared to strategy two.

**Authors' conclusions**

The authors concluded that a partially effective HIV vaccine, as evaluated in this study, would be cost effective. Results suggested that strategies that prioritised key populations were most efficient, but broader strategies provided greater total population health benefit.

**CRD commentary**

**Interventions:**

The range of vaccination strategies assessed was broad with variation based on incorporating coverage rate and population risk. The status quo of no vaccination was included in the model and the full incremental analysis.

**Effectiveness/benefits:**

Clinical data were mostly from a published model that was described elsewhere. It appeared that the authors selected the most appropriate studies, but the validity of these sources was difficult to judge due to limited details provided in the study. Sensitivity analysis was conducted on the key input parameters to assess their impact on results. Expected life years and quality adjusted life years (QALYs) were used appropriately as the benefit measure. The utility values came from published studies, but no details were described.

**Costs:**

Reporting of costs associated with disease progression and vaccination was limited. The costs were presented as macro-category and the sources referenced but not fully described. This may reflect the exploratory nature of the modelling, but further details would have enabled a better understanding of the resources consumed throughout the disease pathway. The authors stated that a societal perspective was adopted but the analysis considered only health care-related costs. The price year and discounting were clearly presented. Variation in vaccine costs was considered in the sensitivity analysis; given that the cost of vaccine was speculative, sensitivity analysis of this parameter was essential.

**Analysis and results:**

Some details of the model were presented in the main paper and supplemented in an appendix. The results were extensively presented with both tables and graphs. The costs and benefits were appropriately synthesised. The analysis of uncertainty considered wide variations in the model assumptions, but given the speculative nature of the analysis further testing of these assumptions would be warranted in any future modelling. The authors discussed the strengths and limitations of their study. The modelling approach taken seems reasonable and despite some limitations was generally well reported.
Concluding remarks:
The conclusions are appropriate within the scope of the analysis undertaken. The limitations of the analysis should be borne in mind.

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