The cost effectiveness of universal antenatal screening for HIV in New Zealand

Bramley D, Graves N, Walker D

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 use of universal antenatal screening for human immunodeficiency virus (HIV) in pregnancy. All pregnant women would be offered an HIV test as part of their antenatal care, to minimise the risk to their babies of HIV infection.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised all pregnant women in New Zealand who agreed to enter the screening programme (and the antenatal population in New Zealand).

Setting
The clinical setting appears to have been secondary care. The economic study was performed in Auckland, New Zealand.

Dates to which data relate
The effectiveness evidence and resource use data were taken from studies published between 1991 and 2001. The price year was 1999.

Source of effectiveness data
The effectiveness data were derived from a review of completed studies and experts' opinion.

Modelling
A model was developed to estimate the long-term incremental costs and incremental benefits of universal antenatal screening for HIV, in comparison with targeted screening of high-risk pregnant women. However, the authors did not report any information on the type or the structure of the model used.

Outcomes assessed in the review
The outcomes assessed in the review, which were used as inputs for the model, were:

the population of pregnant women,

the rate of acceptance of universal screening,
the false-positive rate,

the percentage of terminated pregnancies in true-positives,

the incidence of transmission with and without treatment,

the life expectancy of HIV and non-HIV babies, and

the mothers’ gain in life expectancy due to early treatment.

A base-case value was given for each parameter, along with unfavourable and favourable values.

**Study designs and other criteria for inclusion in the review**
The effectiveness data were taken from official statistics and published studies. However, the authors did not provide any information on the study designs or the inclusion criteria.

**Sources searched to identify primary studies**
Not stated.

**Criteria used to ensure the validity of primary studies**
Not stated.

**Methods used to judge relevance and validity, and for extracting data**
Not stated.

**Number of primary studies included**
The effectiveness data were derived from 19 primary studies.

**Methods of combining primary studies**
There was no information on the method used to combine the primary studies. Some parameters were obtained from single primary studies.

**Investigation of differences between primary studies**
Not performed.

**Results of the review**
The population of pregnant women was 55,865 in the base-case (unfavourable value: 50,000, favourable value: 60,000).

The percentage of pregnant women who accept universal screening was 85% (unfavourable: 70, favourable: 100%).

The false-positive rate was 0.09% (unfavourable: 0.10, favourable: 0.08).

The termination rate in true-positive pregnant women was 20% (unfavourable: 40, favourable: 0).

The incidence of transmission was 25% (unfavourable: 14, favourable: 33) without treatment, and 2% (unfavourable: 4, favourable: 1) with treatment.

The life-expectancy of non HIV-infected babies was 39.12 years (unfavourable: 36.20, favourable: 40.71).
The life-expectancy of HIV-infected babies was 8.16 years (unfavourable: 19.52, favourable: 4.71).
The mother's gain in life-expectancy due to early treatment was 1 year (unfavourable: 0, favourable: 2).

**Methods used to derive estimates of effectiveness**
The prevalence of HIV and the number of cases detected from existing surveillance were derived on the basis of experts’ opinion (personal communication).

**Estimates of effectiveness and key assumptions**
The prevalence of HIV was assumed to be 0.03% in the base-case (unfavourable case: 0.02, favourable case: 0.04). The number of cases detected from existing surveillance was assumed to be 8 (unfavourable: 9, favourable: 7).

**Measure of benefits used in the economic analysis**
The measures of benefits used in the economic analysis were the incremental number of HIV cases detected (true positives) with universal screening with respect to targeted screening, the number of HIV cases avoided in babies, and the discounted life-year gained (LYG) in mothers and babies with universal screening.

**Direct costs**
The future costs were discounted at a rate of 5%. The unit costs were reported separately from resource use and the quantity/cost boundary was that of the health care sector. The categories of costs included in the analysis were pre-test and post-test counselling, HIV antibody tests, medical treatments for mothers and babies, outpatient visits, Caesarean section, and other diagnostic consultations. The unit costs were mainly taken from published studies but, when there was insufficient information in the literature, they were based on experts' opinion. Quantities of resource use were derived on the basis of guidelines for the universal screening programme and targeted screening. The unit costs were obtained from official price lists, published studies and experts' opinion, but mainly the former (Auckland District Health Board Finance Department, 2001). The price year was 1999.

**Statistical analysis of costs**
No statistical analyses of the costs were carried out.

**Indirect Costs**
The indirect costs were not included in the analysis.

**Currency**
New Zealand dollars (NZ$). The authors also reported the total costs and incremental costs in US dollars ($), and the conversion rate at the time the research was conducted.

**Sensitivity analysis**
One-way sensitivity analyses were performed on key parameters:

- the population of pregnant women,
- the rate of screening acceptance,
- HIV prevalence,
- the number of cases detected with existing surveillance,
the incidence of transmission with and without treatment,

the life-expectancy in HIV and non-HIV babies,

the unit cost of the antibody test,

the minutes of pre-test counselling,

the mother net gain in life expectancy with early treatment, and

the lifetime care cost for HIV babies.

These parameters were chosen because a change in cost-effectiveness ratios of greater than 5% was found when unfavourable and favourable cases were applied. Two-way sensitivity analyses were also performed to estimate the changes in cost per outcomes. These varied HIV prevalence (simultaneously) and all the other parameters used in the univariate sensitivity analyses (individually). Finally, a threshold analysis was performed using the gross national product per capita in New Zealand, in the year 2000, as the threshold value.

**Estimated benefits used in the economic analysis**

In the base-case, universal antenatal screening led to the identification of 14.25 true-positive women per year. Since 8 cases would have been detected with targeted screening, the incremental number of true-positive HIV pregnant women identified with universal screening was 6.25. Assuming that 1.25 women would decide to terminate the pregnancy, the universal screening programme detected an incremental number of 5 babies exposed to HIV. Appropriate treatment resulted in 1.15 cases of avoided HIV infection in babies and a net gain of 41.97 discounted life-years (in babies and mothers).

**Cost results**

In the base-case, universal antenatal screening resulted in an incremental cost of NZ$723,607 ($307,917) with respect to targeted screening.

**Synthesis of costs and benefits**

Incremental cost-effectiveness ratios were calculated to combine the costs and benefits of the interventions under evaluation. In the base-case, the incremental cost of universal screening per HIV case detected was NZ$115,859 ($49,301), the incremental cost per case of HIV infection avoided in babies was NZ$629,669 ($267,944), and the incremental cost per discounted LYG was NZ$17,241 ($7,336).

The cost-effectiveness ratios were very sensitive to changes in the HIV prevalence rate, but were less sensitive to the other parameters in the univariate sensitivity analyses.

The cost per discounted LYG ranged from a best case of NZ$10,433 (HIV prevalence 4%) to a worst case of NZ$32,527 (HIV prevalence 2%).

In all the other cases analysed, the incremental cost per discounted LYG ranged from a minimum of NZ$10,004 to a maximum of NZ$32,527.

The two-way sensitivity analyses confirmed the role of HIV prevalence in changing the final incremental cost-effectiveness ratios.

Cost-effectiveness scenarios were presented graphically for a threshold value of NZ$30,951, which represented the gross national product per capita in 2000 in New Zealand. For example, the threshold value for prevalence rate was 0.0278% when the rate of screening acceptance was 70%, and 0.0216% when the acceptance rate was 100%.
Authors' conclusions
The cost-effectiveness results obtained for the universal antenatal screening strategy for human immunodeficiency virus (HIV) compared favourably with results found in the literature for similar interventions. However, it was difficult to assess whether the implementation of universal screening should be considered a cost-effective strategy in the context of New Zealand, given the lack of information on the decision-makers' willingness to pay for an additional life-year gained (LYG).

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. The authors compared a strategy of universal antenatal HIV screening with the existing screening strategies in New Zealand, to estimate whether this could be considered a cost-effective strategy. You should decide whether these are valid comparators in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness data were mainly derived from published studies. The authors did not perform a systematic review of the literature, nor did they provide information on the inclusion criteria or the methods used to conduct the review. Given the lack of data found in the literature, some parameters were obtained on the basis of experts' opinion. Several sensitivity analyses were performed to allow for uncertainty around key effectiveness parameters.

Validity of estimate of measure of benefit
Three different measures of benefits were used in the analyses. In particular, the use of the discounted LYG as a final measure of outcome allowed the authors to compare their results with other published studies of similar interventions. The final outcomes were obtained by developing a decision model, but no information on the type or structure of the model was provided.

Validity of estimate of costs
The authors stated that some categories of costs that might have been relevant, given the perspective adopted (e.g. the costs of setting up, managing and publicising a universal screening programme), were not included in the analysis. A detailed breakdown of the cost categories was given and the unit costs were presented separately from the resources used. The majority of the unit costs were obtained from reliable sources, with experts' opinion being requested only when data were unavailable. Sensitivity analyses were performed to investigate the impact of varying key parameters on the final cost-effectiveness ratios. The authors performed appropriate currency conversions and discounted future costs in line with existing guidelines. The price year was reported, thus simplifying reflation exercises in other settings.

Other issues
The authors compared the results of their analysis with findings of published studies of similar interventions, which were performed in other countries (e.g. the UK and USA). Also, the results of published studies performed in New Zealand were used to compare the incremental cost-effectiveness ratios obtained and to estimate the decision-makers' willingness to pay in this context. The issue of generalisability was addressed through several sensitivity analyses and the provision of details on the unit costs and cost categories. The use of experts' opinion was necessary because of the lack of reliable data for some key parameters. The authors stated that this analysis offered the best available estimates in New Zealand.

Implications of the study
The results of this study suggested that universal antenatal HIV screening should be implemented on the basis of the cost-effectiveness threshold commonly applied in countries such as the USA, UK and Canada. However, given the lack of information about the policy-makers' willingness to pay in New Zealand, the choice for this country remains uncertain.
Source of funding
None stated.

Bibliographic details

PubMedID
12646798

DOI
10.1097/01.aids.000050810.06065.36

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Cost-Benefit Analysis; Female; HIV Infections /diagnosis /economics /prevention & control /transmission; Health Care Costs; Humans; Infectious Disease Transmission, Vertical /economics /prevention & control; Mass Screening /economics; New Zealand; Pregnancy; Pregnancy Complications, Infectious /diagnosis /economics; Prenatal Diagnosis /economics; Sensitivity and Specificity; Value of Life /economics

AccessionNumber
22003000804

Date bibliographic record published
30/04/2004

Date abstract record published
30/04/2004