Cost-effectiveness of universal compared with voluntary screening for human immunodeficiency virus among pregnant women in Chicago

Immergluck L C, Call W L, Schwartz A, Elstein A S

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
Universal screening for HIV among pregnant women was compared with voluntary screening and no screening. This test was performed within the first fourteen weeks of pregnancy.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population was pregnant women who presented for antenatal care within the first fourteen weeks of pregnancy and who had not disclosed HIV-positive status.

Setting
This economic study was carried out in Chicago, Illinois, USA. The clinical setting was not stated but presumably the screening can be done in a physician's office.

Dates to which data relate
The effectiveness data related to the years 1989 to 1998. The cost data were collected from 1993 to 1998.

Source of effectiveness data
The data came from a synthesis of published studies and professional opinion.

Modelling
A decision tree model was developed to estimate the cost per pregnant woman screened, the number of paediatric HIV cases and the number of new-born life years expected for each screening option.

Outcomes assessed in the review
The following outcomes were assessed from the review:

- the prevalence of HIV in pregnant women;
- vertical transmission rates without AZT, with maternal and infant AZT and with only infant AZT within 48 hours of birth;
the probability of accepting HIV testing under voluntary screening;
the probability of accepting AZT;
the average life expectancy of an HIV-infected child;
the sensitivities and specificities of the enzyme-linked immunosorbent assay (ELISA), Western blot (WB) and HIV DNA polymerase chain reaction (PCR) tests.

**Study designs and other criteria for inclusion in the review**
A range of sources were synthesised to populate the model. Criteria for study inclusion in the review were not reported.

**Sources searched to identify primary studies**
The data came from published studies, personal communications and the Illinois Department of Public Health.

**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 synthesised from 20 published studies and two personal communications.

**Methods of combining primary studies**
Not stated.

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

**Results of the review**
The following data were obtained:
the prevalence of HIV in pregnant women was 0.41% (range: 0.01% - 0.022%);
the vertical transmission probability without AZT was 0.255 (range: 0.2 - 0.4), with maternal and infant AZT was 0.083 (range: 0 - 0.13) and with only infant AZT within 48 hours of birth was 0.127 (range: 0.127 - 0.255);
the probability of accepting HIV testing under voluntary screening was 0.927 (range: 0.3 - 1.0);
the probability of accepting AZT was 0.7 (range: 0.5 - 1.0);
the average life span of an HIV-infected child was 9.4 years (range: 5 - 25 years);
the sensitivities and specificities were 1.0 (range: 0.9 - 1.0) and 0.99 (range: 0.95 - 1.0) for ELISA, 0.99 (range: 0.8 - 1.0) and 0.99 (range: 0.8 - 1.0) for WB, and 0.99 (range: 0.95 - 1.0) and 1.0 (range: 0.9 - 1.0) for PCR.
Estimates of effectiveness and key assumptions
The major assumptions made in conducting the analysis were that all pregnant women were screened within the first 14 weeks of pregnancy, all women received pre-test counselling and post-test counselling which was more costly for those who tested positive and that universal testing would not result in fewer women taking up antenatal care.

Measure of benefits used in the economic analysis
The measure of health benefit used was the number of HIV-infected babies.

Direct costs
Resource use quantities were not reported separately from costs. The following health services costs were included: HIV testing, post-test counselling and the lifetime cost of caring for HIV infected new-borns. This lifetime cost was derived from published data on the medical costs of caring for children with AIDS (including hospitalisations, GP visits, emergency room visits, home health care and prescribed medications) and the cost of care for children with HIV without AIDS under the assumption that HIV-positive children would live for 7.4 years without AIDS and then 2 more years with AIDS. A discount rate of 3% was applied to future costs. The authors used average costs that related to data published between 1993 and 1998.

Statistical analysis of costs
The cost data were treated deterministically with no allowance for uncertainty.

Indirect Costs
The authors included the value of a pregnant woman's time to attend post-test counselling. This time was valued at the median earnings of all workers. The quantity data were published in 1996 and were not presented separately from unit costs, which were published in 1993. Discounting was not relevant.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analysis was carried out to assess the generalisability of the results and their robustness to variability in the data reported in the literature. Separate one-way sensitivity analyses were conducted for all cost and effectiveness variables. A two-way sensitivity analysis was carried out to examine how results vary as a function of the voluntary screening rates for HIV-positive and HIV-negative women. The ranges were based on published studies and expert opinion.

Estimated benefits used in the economic analysis
Using baseline parameters, for every 100,000 pregnant women screened, universal screening would result in 40 cases of paediatric HIV and 7,607,329 expected life years of new-borns as compared with voluntary screening which would result in marginally more paediatric HIV cases (44.8) and fewer life years of new-borns (7,607,015). No screening would result in 104.6 cases and 7,603,027 life years.

Cost results
The expected total costs per 100,000 pregnant women screened were $11,081,163 for universal screening and $11,350,608 for voluntary screening. No screening was expected to cost $14,772,184.

Synthesis of costs and benefits
In comparison with voluntary screening, universal screening would avert 4.8 additional cases of paediatric HIV and save $269,445 for every 100,000 pregnant women screened. Alternatively, universal screening would result in 314 more years of life for new-borns compared with voluntary screening. In comparison with no screening, universal screening would result in cost savings of $3.69 million and avert 64.6 cases for every 100,000 pregnant women screened.

In the baseline case, universal screening dominated voluntary screening and no screening. This conclusion was sensitive to the HIV prevalence rate among pregnant women (who had not disclosed HIV-positive status). At prevalence rates below 0.21%, universal screening was no longer cost saving so decision makers must decide if the additional health benefit is worth the cost. The authors observed that, even at a prevalence rate of 0.01%, universal screening remained within conventional boundaries of cost-effectiveness.

Authors’ conclusions
The authors concluded that universal screening for HIV among pregnant women would avert paediatric HIV cases and save money in comparison with voluntary screening in Chicago. The benefits of universal screening may be larger for communities where mothers are less likely to volunteer for screening.

CRD COMMENTARY - Selection of comparators
The comparator of voluntary screening is justified as it is current practice in Illinois. The practice of voluntary screening may vary from setting to setting, for example, depending on how screening is offered to the woman and by whom, but appears to correspond to “opt-in” screening in the NHS for example. Although not realistic as a policy option, no screening has been included for methodological completeness. The authors did not state the clinical setting in which their screening was carried out but presumably it can be done in a physician's office.

Validity of estimate of measure of effectiveness
It is not clear how the data from the primary sources were combined, although the study's conclusion was robust to one-way sensitivity analyses over wide ranges of values. Sensibly, the authors distinguished between HIV-positive and HIV-negative women in their willingness to be tested. It is worth noting that the study has a baseline voluntary screening rate of 92.7%, which may be higher than in other places. The impact of this difference on the cost-effectiveness of universal screening will depend on whether or not HIV-negative women were also resistant to being tested. Moreover, the authors did not estimate the acceptance rate under universal screening, which is not necessarily 100% because women have the right to informed refusal. This makes it difficult to interpret the generalisability of the study’s findings.

Validity of estimate of measure of benefit
The authors noted, as a limitation of their study, that they did not take into account the quality of life for children with HIV. Doing so would have made the results for universal screening more favourable.

Validity of estimate of costs
Costs and quantities were not reported separately making it difficult to generalise the findings to other settings. The authors excluded some costs that were direct consequences of a woman's HIV being detected in pregnancy (i.e., earlier than it would otherwise have been). These included the cost of a Caesarean instead of a vaginal delivery and the cost of treating the mother's HIV after delivery. These costs may be substantial if one considers that the mother may be on costly combination therapy for many years after giving birth. The authors also excluded the cost of following up babies born to HIV-positive mothers to determine their HIV-status or any effect of antiretrovirals received in utero.

Implications of the study
While this analysis is useful in its own setting, some of its features make it difficult to apply its conclusions to other settings. Of particular concern is diversity in the screening rates attained under voluntary and universal screening. Not all sensitivities analyses were reported in detail.
Source of funding
Supported by a grant (to L C Immergluck) from the Campus Review Board, University of Illinois.

Bibliographic details

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; AIDS Serodiagnosis /economics; Chicago; Comparative Study; Cost-Benefit Analysis; Decision Support Techniques; Female; HIV Infections /diagnosis /economics /prevention & control /transmission; Humans; Infant, Newborn; Infectious Disease Transmission, Vertical /prevention & control; Mass Screening /economics; Patient Acceptance of Health Care; Pregnancy; Pregnancy Complications, Infectious /diagnosis; Probability; Research Support, Non-U.S. Gov't; Urban Population

AccessionNumber
22000000705

Date bibliographic record published
31/10/2001

Date abstract record published
31/10/2001