Is antenatal syphilis screening still cost effective in sub-Saharan Africa

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
On-site antenatal syphilis screening and treatment at antenatal clinics (ANC) was examined. Treatment consisted of a single dose of benzathine penicillin (2.4 MU by intramuscular injection).

Type of intervention
Screening and treatment.

Economic study type
Cost-effectiveness analysis; cost-utility analysis.

Study population
The study population comprised pregnant women undergoing routine antenatal care.

Setting
The setting was primary care. The economic study was carried out in Tanzania.

Dates to which data relate
The effectiveness data were derived from studies published between 1991 and 2002. Resource use was gathered from July 1998 through June 1999. The price year was 2001.

Source of effectiveness data
The effectiveness evidence was derived from a synthesis of completed studies.

Outcomes assessed in the review
The outcomes assessed from the literature were the number of adverse birth outcomes averted, sequelae of adverse pregnancy outcomes, and life expectancy.

Study designs and other criteria for inclusion in the review
A systematic review of the literature does not appear to have been undertaken. The authors reported the design of two of the primary studies that were used as the main sources of evidence. One was a retrospective cohort of 382 women recruited at 3 hospitals in the region of Mwanza. The other was a prospective cohort of ANC attendees who were followed to delivery. Life expectancy was derived from both the World Development Report (WDR) by the World Bank and Tanzanian statistics.

Sources searched to identify primary studies
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
Six primary studies provided evidence.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
The total number of adverse birth outcomes averted with screening and treatment was 75.

In particular, the number of stillbirths averted with the intervention over routine care was 44 of the 187 susceptible cases. The number of low birth weight (LBW) infants averted with the intervention over routine care was 31 of the 140 susceptible cases.

For sequelae of adverse pregnancy outcomes, approximately 13% of LBW infants would have died and 6% would have experienced a lifelong disability with a disability weight of 0.291.

Tanzanian life expectancy at birth was 45 years. Life expectancy at birth according to the WDR was 81.75 years.

Measure of benefits used in the economic analysis
The summary benefit measures used were the LBW live births averted, stillbirths averted, all adverse outcomes (stillbirths and LBW) averted, and disability-adjusted life-years (DALYs) saved. DALYs saved were estimated using published methodology. Since the inclusion of stillbirth was a controversial issue in the calculation of DALYs, the benefits of the intervention were presented with and without stillbirth. The DALYs were discounted.

Direct costs
Discounting was not relevant and was not applied. However, capital goods were given an estimated life of between 3 and 10 years and were discounted at a rate of 3%. As the intervention was added to existing ANC services, only the incremental costs were evaluated. The unit costs were not presented separately from the quantities of resources used as the costs were presented as macro-categories. The health services included in the economic evaluation were start-up and implementation of the intervention (including treatment of partners). In particular, capital goods (building, equipment, vehicles, training, and start-up) personnel (laboratory staff, a counsellor, a nurse, and a team leader), supplies and transportation were considered. Research-associated costs were not considered.

The cost/resource boundary of the service provider was adopted. Resource use was estimated using direct data collected from July 1998 through June 1999. The costs were estimated using the Costing Guidelines for HIV Prevention Strategies, which used an ingredient-based costing methodology. Both financial and economic costs were estimated.
Economic data were collected from administrative records in the health clinic, the research project accounts, and the African Medical and Research Foundation office in Mwanza. The price year was 2001.

**Statistical analysis of costs**
The costs were treated deterministically.

**Indirect Costs**
The indirect costs were not considered in the economic evaluation.

**Currency**
Tanzanian shillings. These were converted into US dollars ($). The conversion rate ranged from 619 to 749 Tanzanian shillings per US dollar in the year of the expenditure.

**Sensitivity analysis**
Univariate sensitivity analyses were carried out to test the robustness of the estimated cost-utility ratios to variations in all the main assumptions made in the analysis. Such assumptions included personnel time inputs, study coordinator’s input, discount rate for both DALYs and costs, syphilis test characteristics, mortality rate of LBW infants, development of congenital syphilis, and syphilis prevalence.

**Estimated benefits used in the economic analysis**
It was estimated that 31 LBW live births and 44 stillbirths were averted with the intervention over routine antenatal screening. Thus, the number of all adverse outcomes (stillbirths and LBW) averted was 75.

The DALYs saved were:

- 127 without stillbirth and using Tanzanian life expectancy;
- 151 without stillbirth and using WDR life expectancy;
- 1,321 with stillbirth and using Tanzanian life expectancy; and
- 1,571 without stillbirth and using WDR life expectancy.

**Cost results**
The total incremental costs associated with the intervention relative to routine antenatal screening were $13,956 ($1,090 for capital costs and $12,866 for recurrent costs).

Supplies costs represented 54% of the whole expenditure and personnel costs 37%.

**Synthesis of costs and benefits**
Incremental cost-effectiveness and cost-utility ratios were calculated to combine the costs and benefits of the intervention in comparison with routine antenatal care.

The incremental cost per LBW live birth averted was $451.18.

The incremental cost per stillbirth averted was $318.37.

The incremental cost per adverse outcome saved was $186.66.
The incremental cost per DALY averted was:

$110.03 without stillbirth and using Tanzanian life expectancy;

$92.56 without stillbirth and using WDR life expectancy;

$10.56 with stillbirth and using Tanzanian life expectancy; and

$8.88 without stillbirth and using WDR life expectancy.

The sensitivity analysis revealed that the estimated cost-utility ratios were not sensitive to variations in the cost assumptions.

The variables that had the greatest impact on the results of the base-case were discount rate in the DALY calculation (resulting in a change ranging from -36% to 79%) and the percentage of rapid plasma reagin (RPR) test-positive women with high titre active syphilis (resulting in a change ranging from 34% to -49%).

Other assumptions had a reduced impact.

The cost per DALY saved decreased substantially as prevalence increased. However, even at an RPR prevalence as low as 2%, antenatal screening and treatment remained cost-effective ($33 per DALY saved including stillbirth).

**Authors’ conclusions**
Antenatal syphilis screening and treatment was a cost-effective strategy in Tanzanian pregnant women. The cost-effectiveness ratios fell below the suggested upper bound of cost-effective interventions given by the World Development Report (WDR; $193).

**CRD COMMENTARY - Selection of comparators**
The selection of the comparator was appropriate as it reflected the standard pattern of care in the authors' setting. It allowed also for the additional impact of antenatal syphilis screening and treatment to be evaluated. You should decide whether this is a valid comparator in your own setting.

**Validity of estimate of measure of effectiveness**
The effectiveness data were derived from published studies that had been carried out in the study setting. Therefore, most of the estimates used in the analysis were specific to Tanzanian features. It appears that a systematic review of the literature has not been carried out. Rather, primary studies appear to have been identified selectively. The characteristics of some primary studies were described in detail and extensive information was reported, not only on the sample of women included in the analysis but also on the results of the follow-up. The primary estimates appear to have been combined using narrative methods. The issue of uncertainty in the effectiveness data was investigated extensively in the sensitivity analysis.

**Validity of estimate of measure of benefit**
Several benefit measures were used in the economic analysis. Some of them were specific to the disease considered in the study, while DALYs represented a more comparable measure. The estimation of DALYs was based on a published approach and two distinct calculations were made, depending on whether stillbirths were included or not. Similarly, two different estimates of life expectancy were used to make the results of the current study more comparable with those from other economic evaluations. Discounting was applied to the DALYs, and the impact of varying the discount rate was investigated in the sensitivity analysis.

**Validity of estimate of costs**
The authors stated explicitly which perspective was adopted in the study. As such, all the relevant categories of costs
were included in the analysis. The costs were mainly presented as macro-categories and a detailed breakdown of the items was not provided. However, an ingredient-based costing methodology was used and the costs were classified by input type. Only incremental costs were presented as the analysis focused on the additional costs associated with the intervention under examination. The price year was reported, which enhances the possibility of performing reflation exercises in other settings. The cost estimates were specific to the study setting but were varied in the sensitivity analysis. The source of the data was reported.

Other issues
The authors made extensive comparisons of their findings with those from three published studies. In particular, the results of the other studies were reported in detail and compared explicitly using a comparison table. Overall, the results were comparable. Further, the intervention under examination compared favourably with other child health interventions implemented in similar settings.

Implications of the study
The study results suggested that antenatal syphilis screening and treatment represented good value for money and should be urgently added to routine antenatal services in sub-Saharan African countries.

Source of funding
Funded by the Wellcome Trust (training fellowship in clinical tropical medicine), the Medical Research Council, and the UK Department for International Development.

Bibliographic details

PubMedID
14573832

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Cohort Studies; Cost-Benefit Analysis; Female; Follow-Up Studies; HIV Infections /prevention & control; Humans; Pregnancy; Pregnancy Complications, Infectious /diagnosis /economics /epidemiology; Prenatal Diagnosis /economics; Prevalence; Retrospective Studies; Syphilis /diagnosis /economics /epidemiology; Tanzania /epidemiology

AccessionNumber
22003001411