Strategic options for antenatal screening for syphilis in the United Kingdom: a cost effectiveness analysis
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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.

Health technology
Universal antenatal screening for syphilis was compared to targeted screening of high-risk groups or no screening.

Type of intervention
The type of intervention used in this study was screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised pregnant women in the UK, from which three high-risk groups were identified when considering screening strategy options: pregnant women in the Thames region, women from non-white ethnic groups, and women born outside the UK.

Setting
The setting for this study was secondary care. The universal screening programme was set in the UK.

Dates to which data relate
The efficacy and resource use data related to studies published in 1997 and 1998, including survey data collected between 1994 and 1997. The price year used was 1997.

Source of effectiveness data
The source of effectiveness data was a review of previously completed studies.

Outcomes assessed in the review
The following outcomes were assessed in the preliminary review of the syphilis screening programme in the UK, before the strategic options were considered:

- number of pregnancies in the UK,
- number of confirmatory tests, and
- number of women treated for syphilis.

The following outcomes were assessed in the review of strategic options:

- prevalence of syphilis requiring treatment/1000 live births (95% CI);
pregnant women treated for syphilis, detected by screening in 3 years;
congenital syphilis cases prevented by screening in 3 years;
percentage of women treated for syphilis detected by screening option;
number of women needed to screen to detect one women requiring treatment; and
number of women needed to screen to prevent one case of congenital syphilis.

**Study designs and other criteria for inclusion in the review**
The authors reported that this study used epidemiological data from surveys conducted by the UK Public Health Laboratory Service (PHLS) to determine the best strategic option for antenatal syphilis screening in the UK.

**Sources searched to identify primary studies**
The authors did not specify the sources searched to identify primary studies.

**Criteria used to ensure the validity of primary studies**
The study did not report the criteria used to ensure the validity of primary studies used to estimate effectiveness measures.

**Methods used to judge relevance and validity, and for extracting data**
The authors did not report the criteria used to judge the relevance or validity of the data or to determine which data were extracted for the review.

**Number of primary studies included**
Two primary studies were included in the review.

**Methods of combining primary studies**
The authors did not specify the methods used to combine data from the two individual studies to estimate individual parameter values.

**Investigation of differences between primary studies**
The study did not report if any differences between primary studies were investigated.

**Results of the review**
The following base case results were reported in the preliminary review of the syphilis screening programme in the UK, before the strategic options were considered:

- number of pregnancies in the UK, 750,267;
- number of confirmatory tests, 15,005; and
- number of women treated for syphilis, 40.3.

The following results for the effectiveness of a universal screening strategy were reported:

- prevalence/1000 live births (95% CI), 0.06;
pregnant women treated for syphilis, detected by screening in 3 years, 121;
congenital syphilis cases prevented by screening in 3 years, 40.4;
percentage of women treated for syphilis detected by screening option, 100;
number of women needed to screen to detect one woman requiring treatment, 18,602; and
umber of women needed to screen to prevent one case of congenital syphilis, 55,713.
The following results for the effectiveness of a 'Thames region' screening strategy were reported:
prevalence of syphilis requiring treatment/1000 live births (95% CI), 0.18;
pregnant women treated for syphilis, detected by screening in 3 years, 85;
congenital syphilis cases prevented by screening in 3 years, 27.2;
percentage of women treated for syphilis detected by screening option, 70;
number of women needed to screen to detect one woman requiring treatment, 6,613; and
number of women needed to screen to prevent one case of congenital syphilis, 20,665.
The following results for the effectiveness of a 'non-white ethnicity' screening strategy were reported:
prevalence of syphilis requiring treatment/1000 live births (95% CI), 0.62;
pregnant women treated for syphilis, detected by screening in 3 years, 85;
congenital syphilis cases prevented by screening in 3 years, 26.6;
percentage of women treated for syphilis detected by screening option, 70;
number of women needed to screen to detect one woman requiring treatment, 1,907; and
number of women needed to screen to prevent one case of congenital syphilis, 6,092.
The following results for the effectiveness of a 'woman born outside the UK' screening strategy were reported:
prevalence of syphilis requiring treatment/1000 live births (95% CI), 0.42;
pregnant women treated for syphilis, detected by screening in 3 years, 93;
congenital syphilis cases prevented by screening in 3 years, 29.4;
percentage of women treated for syphilis detected by screening option, 77;
number of women needed to screen to detect one woman requiring treatment, 2,791; and
number of women needed to screen to prevent one case of congenital syphilis, 8,828.

Methods used to derive estimates of effectiveness
The authors presented two sets of assumptions: those used to estimate the cost of the UK antenatal screening programme and those made to compare the effectiveness of screening strategy options. The methods used to derive the estimates of effectiveness included in the assumptions were not stated explicitly. However, they appear to have been
based on the authors’ opinions and were backed by published literature in some cases.

**Estimates of effectiveness and key assumptions**
The following assumptions were made to estimate the cost of the UK antenatal screening programme:

- the number of screening tests performed is equal to the number of live births in the UK;
- the cost of obtaining, transporting, and labelling the specimens in the antenatal clinic was assumed to be zero;
- 0.2% of screening tests are positive and require confirmatory tests;
- the screening programme detected and treated 40 women per year;
- all women detected by the antenatal syphilis screening programme received adequate treatment, and therefore their infants required only serological follow up.

The following assumptions were made to compare the effectiveness of screening strategy options:

- the vertical transmission rate (VTR) in congenitally transmittable syphilis is 80%;
- the VTR in other cases of syphilis detected by screening is 20%, with a low estimate of 10%, and a high estimate of 30%;
- a third of women detected by screening would progress to tertiary syphilis if untreated;
- all pregnant women are screened for syphilis;
- the number of pregnancies screened during the three years of the survey is equal to the number of live births in the UK in 1994, multiplied by three.

Census data were used to estimate the number of births among women in non-white ethnic groups. The sensitivity and specificity of the combination of screening and confirmatory tests was assumed to be 100%. Treatment for maternal syphilis was assumed to be 100% effective in prevention congenital syphilis, and in treating maternal infection.

**Measure of benefits used in the economic analysis**
The measures of economic benefit used in the assessment of the three strategic options were the number of additional women detected in one year and the number of additional cases of congenital syphilis prevented in one year.

**Direct costs**
Resource use and prices were reported separately. The cost of the antenatal screening programme in the UK included 3 categories:

- the laboratory costs of conducting screening and confirmatory tests;
- antenatal clinic and genitourinary medicine (GUM) clinic costs of investigating and treating women with syphilis; and
- the cost of investigating infants born to women detected by screening.

Data and laboratory costs were obtained from a survey of 12 screening laboratories based in National Health Service (NHS) Trusts, the Blood Transfusion Service, and the Public Health Laboratory Service (PHLS). The laboratories were asked to provide details of reagents, administration, capital and overhead costs. The average total cost of laboratory screening tests was reported to be 4.15. The average total cost of laboratory confirmatory testing was reported to be 9.71.
Estimates of GUM clinic, antenatal clinic, and paediatric clinic costs were obtained from hospitals within a London health authority. The cost of a maternity outpatient attendance was based on the average price contract portfolio in 1996 to 1997. The cost of GUM clinic treatment included the average cost of clinic visits for penicillin injections. The costs of following up the infants of women detected through screening were based on the costs of serology tests at one, two, three and six months of age, and paediatric outpatient visits. The analysis was based on NHS costs and costs were reported at 1997 prices. Discounting was not carried out due to the short time frame of the analysis.

The direct costs of the antenatal syphilis screening programme in the UK were reported as follows:

- Cost of screening tests 517,684 (marginal cost 0.69);
- Cost of confirmatory tests 105,485 (marginal cost 7.03);
- And, cost of treatment and follow up 49,197.

The marginal cost of the screening programme was reported as 672,366, a marginal cost per women screened of 0.90.

Statistical analysis of costs
No statistical analysis of costs was reported.

Indirect Costs
The study did not include the indirect costs of the screening programme.

Currency
UK pounds sterling (£). No currency conversions were reported.

Sensitivity analysis
A sensitivity analysis was carried out by changing the values of the following parameters: the prevalence of syphilis requiring treatment/1000 births; the vertical transmission rate; the sensitivity of the screening test; the cost of the screening test; the cost of treatment and follow-up for woman and infant; maternal compliance with treatment; and the effectiveness of treatment.

Estimated benefits used in the economic analysis
When compared to the universal screening strategy the 'Thames region' strategy detected 12 additional women in one year and 4.4 additional cases of congenital syphilis were prevented. The 'non-white ethnicity' strategy also detected 12 additional women in one year and prevented 4.6 additional cases of congenital syphilis. The 'born outside the UK' strategy detected 9.3 additional women and prevented 3.7 cases in one year of congenital syphilis.

Cost results
The marginal annual cost of the screening programme in the UK was 672,366. This is the equivalent of 90p per woman screened, or 16,670 to detect one woman who needs treatment for the syphilis.

The marginal cost per year was reported as 672,366 for the universal strategy, 190,181 for the 'Thames region' strategy, 79,428 for the 'non-white ethnicity' strategy, and 109,675 for the 'born outside of the UK' strategy.

The marginal cost per woman treated for syphilis was reported as 16,670 for the universal strategy, 6,712 for the 'Thames region' strategy, 2,803 for the 'non-white ethnicity' strategy, and 3,538 for the 'born outside of the UK' strategy.

The marginal cost per congenital syphilis case prevented was reported as 49,928 for the universal strategy, 20,976 for
the 'Thames region' strategy, 8,958 for the 'non-white ethnicity' strategy, and 11,191 for the 'born outside of the UK' strategy.

These costs include the costs of follow-up and treatment of identified cases of syphilis, but not adverse events as a result of the screening process or treatment for syphilis.

**Synthesis of costs and benefits**

The estimated costs and benefits were combined by calculating the incremental cost-effectiveness ratio of the universal screening strategy compared to targeted screening strategies.

The incremental cost-effectiveness of the universal screening strategy over a 1 year time period was:

40,182 per additional woman detected and 109,588 per case prevented compared to the 'Thames' regions strategy;

49,412 per additional woman detected and 128,900 per additional case prevented compared to screening women of non-white ethnicity; and

60,288 per additional woman detected and 153,461 per additional case prevented compared to the 'born outside the UK' screening strategy.

The authors reported that the cost data were sensitive to the cost of the screening test, when this was varied between 0.17 and 2.85. The authors did not report the impact of this variable on the total costs of screening or the incremental cost-effectiveness ratios of universal screening compared to the targeted screening programmes.

**Authors’ conclusions**

The authors concluded that, although the incremental cost per case detected of universal screening was high, targeting or stopping the screening programme would save relatively little money. Although selectively screening groups by country of birth or by ethnic group could detect at least 70% of cases, this could be politically and practically difficult. Targeting by region would also be effective, but would pose similar ethical and medico-legal problems. They recommend that the current universal antenatal screening for syphilis should continue.

**CRD COMMENTARY - Selection of comparators**

A justification was given for the comparisons made, namely that the universal strategy represented current practice in the UK and that the comparators were potential alternatives to consider. The authors reported that published studies have shown antenatal screening to be cost beneficial. You as a user of this database should decide if any of these comparators are widely used health technologies in your own setting.

**Validity of estimate of measure of effectiveness**

The authors did not report whether a systematic search or review of the literature had been undertaken. The authors did not report the methods used to assess the validity of the studies used or data extracted. They appear to have used the data from the available studies selectively but did not consider the differences in the primary studies when estimating effectiveness. The authors justified some but not all of the assumptions with reference to the medical literature. The authors did not report whether there were any adverse events associated with the screening process or the treatment of syphilis. The robustness of the results to uncertainty in some of the estimates of effectiveness was investigated by sensitivity analysis. The sources of data used to generate ranges for the sensitivity analysis were not reported. The authors did not report the effectiveness results generated by the sensitivity analysis.

**Validity of estimate of measure of benefit**

The estimation of benefits was obtained directly from the effectiveness analysis. The summary measure of benefit used was the number of additional women detected and the number of cases of congenital syphilis prevented. This measure does not include any long term impact on mortality or morbidity, or the value of changes in health status of the woman.
or child. The authors also noted that the analysis did not include the benefits of preventing infected mothers or their sexual partners from progressing to tertiary syphilis.

Validity of estimate of costs
The authors reported that the analysis did not include any costs to pregnant women such as anxiety or time taken to attend clinics. The analysis also omitted partner notification and treatment costs for the women's sexual partners. As a user of this database you should decide if the omission of such costs is likely to affect your interpretation of the authors' conclusions. Costs and quantities were reported separately. The authors also estimated marginal costs for each option, which is appropriate for this analysis.

Other issues
The authors did not compare their findings with those from other studies and the issue of generalisability to other settings was not addressed explicitly. They did, however, discuss the experiences of other screening programmes when assessing the difficulties of targeted strategies.

The study considered pregnant women in the UK with specific reference to three high-risk groups and this was reflected in the authors' conclusions.

The authors reported a number of further limitations to their study. Firstly, laboratories used different methods to calculate overheads. Secondly, the authors advised that the incremental cost-effectiveness results comparing alternative strategies with universal screening should be treated with caution, as laboratories and clinics may find it administratively difficult to move from universal to selective screening. Thus selectively screening the population groups may not result in proportionately lower costs.

Implications of the study
The authors suggested that the analysis supports the continued use of the current universal antenatal screening strategy in the UK.

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