Modelling the cost effectiveness of rapid point of care diagnostic tests for the control of HIV and other sexually transmitted infections among female sex workers

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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
The authors studied the use of a combined Neisseria gonorrhoeae (NG)/Chlamydia trachomatis (Ct) rapid point of care (POC) diagnostic test.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised female sex workers (FSWs), their clients and the general population in Cotonou, Benin. Further details of the population were not reported but may be available in a related study (Alary et al. 2002, see 'Other Publications of Related Interest' below for bibliographic details).

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

Dates to which data relate
Inputs into the model were taken from papers published between 1998 and 2002. The resource use data were obtained from the clinical study reported in the two Alary papers (2002, 1998). The price year was 2004.

Source of effectiveness data
The effectiveness data were derived from a review of the literature.

Modelling
The authors used a deterministic model to estimate the impact of the SIDA2 project (Alary 2002) on the transmission of the human immunodeficiency virus (HIV) or STI in the study population. Initially, the model was used to fit available data on HIV, Ng/Ct and genital ulcer disease (GUD) prevalence. Once this was achieved, the model was used to estimate the impact of SIDA2 improving diagnoses and then SIDA2 improving treatment, following which the authors explored how the treatment aspect would change if POC testing had been used. SIDA2 was an existing STI/HIV prevention project targeted at FSWs in the study setting.

Outcomes assessed in the review
The authors populated their model using:
epidemiological data,
transmission probabilities,
population size and demographic inputs,
fixed sexual behaviour and sex worker behaviour,
distribution of sexual activity,
condom usage,

STI treatment of FSWs at SIDA2 clinic, and

STI treatment at public and private clinics.

The latter element included sensitivity and specificity data.

Study designs and other criteria for inclusion in the review
Not reported.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

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

Number of primary studies included
A total of 31 primary studies were used in the review.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported.

Results of the review
Full details of all model parameters were provided in table 1 of the original paper. In terms of effectiveness data, the intervention (syndromic management) had a sensitivity of 92% in men and 87% in women and a specificity of 60.3% in men and 42% in women.

The effectiveness of treatment following syndromic management was 50 to 90% (personal communication).

The SIDA2 clinic using modified syndromic management resulted in a sensitivity of 48% and a specificity of 75%.
The effectiveness of treatment following modified syndromic management was 95%.

**Measure of benefits used in the economic analysis**
The authors used the number of Ng/Ct cases averted and the number of HIV cases averted as their summary measures of health benefit. These estimates were taken directly from the effectiveness study.

**Direct costs**
The costing analysis was carried out from the perspective of the health care provider. The authors focused on the additional economic costs of using the tests (additional staff training, time taken to administer the test and purchasing the test itself) and estimated data from the SIDA2 trial (Alary et al. 1998) or a further published paper (Alary et al. 2005). Since there was no combined Ng/Ct test in existence, the authors made assumptions and tested these using sensitivity analyses. Although the time horizon for the costing spanned 4 years, there was no evidence that discounting was carried out to take account of time preference. The costs were inflated to 2004 prices.

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

**Indirect Costs**
The indirect costs were not relevant to the perspective of the study.

**Currency**
US dollars ($).

**Sensitivity analysis**
A univariate sensitivity analysis was used to investigate the degree to which the cost parameters affected the incremental cost-effectiveness. Variability in all parameters was explored. It was unclear exactly how the authors selected the ranges they explored. Salary was varied in order to understand the generalisability of the results to other settings.

**Estimated benefits used in the economic analysis**
The SIDA2 clinic using POC testing resulted in a sensitivity of 50 to 80% and a specificity of 95%. The effectiveness of treatment following modified syndromic management was 95%.

The model indicated that using modified syndromic management resulted in 10% (95% confidence interval, CI: 8 to 13) of Ng/Ct cases averted and 6% (95% CI: 4 to 8) of HIV cases averted.

The model indicated that the use of POC testing assuming 95% specificity and 60% sensitivity (worst-case scenario explored) resulted in 13% (95% CI: 10 to 16) of Ng/Ct cases averted and 8% (95% CI: 5 to 10) of HIV cases averted.

The model indicated that the use of POC testing assuming 95% specificity and 70% sensitivity resulted in 15% (95% CI: 12 to 18) of Ng/Ct cases averted and 9% (95% CI: 6 to 11) of HIV cases averted.

The model indicated that the use of POC testing assuming 95% specificity and 80% sensitivity resulted in 17% (95% CI: 13 to 20) of Ng/Ct cases averted and 10% (95% CI: 6 to 12) of HIV cases averted.

**Cost results**
The incremental cost of using Ng/Ct POC tests for 4 years was $13,399 if the test cost $1 and $34,621 if the test cost...
Staff costs were estimated to be $2,778. The authors reported that the test costs varied from $10,550 to $31,650 for a test costing $1 to $3.

Synthesis of costs and benefits
For a test with 70% sensitivity, the incremental cost (uncertainty bound) per NG/Ct infection averted was $1.6 (1.4 to 1.7) for a test costing $1, $2.9 (2.6 to 3.2) for a test costing $2, $4.3 (3.8 to 4.7) for a test costing $3, and $5.6 (5.0 to 6.3) for a test costing $4.

For a test with 70% sensitivity, the incremental cost (uncertainty bound) per HIV infection averted was $81.0 (62.3 to 131.1) for a test costing $1, $151.4 (116.5 to 244.9) for a test costing $2, $221.8 (170.6 to 358.8) for a test costing $3, and $292.2 (224.7 to 472.6) for a test costing $4.

The incremental cost-effectiveness was reported to be "highly dependent on the cost and sensitivity of the test".

Authors' conclusions
Point of care (POC) tests could be a cost-effective use of resources for increasing the impact of treatment interventions for sexually transmitted infections (STIs) in resource poor settings, even if they cost up to $4 per test.

CRD COMMENTARY - Selection of comparators
The authors compared the use of diagnosis using a combined Ng/Ct POC test with syndromic diagnosis. Syndromic diagnosis represented current practice in the authors' setting. Readers must assess whether these technologies represent appropriate comparators in their own setting.

Validity of estimate of measure of effectiveness
Although a review of the literature was carried out, very few details of this review were reported. It was unclear whether the literature was searched systematically, and it seems as though the data have been included selectively to provide inputs relevant to the model. It was unclear how the authors had combined data from the primary studies, although they did give a clear report of which sources were used to inform which data inputs.

Validity of estimate of measure of benefit
The number of Ng/Ct cases averted and HIV cases averted were used as summary measures of health benefit. These measures give a good indication of the benefit derived. In particular, HIV cases averted is a useful measure for comparisons with other technologies aimed at reducing HIV transmission. However, the measure is not widely comparable with health technologies outside this field, as would be the case with cost-utility analyses.

Validity of estimate of costs
The authors focused on the incremental costs of delivering the POC test. The costing was carried out from the perspective of the provider and elements relevant to that perspective were appropriately incorporated. A combined test was recognised not to exist, therefore the authors used a sensitivity analysis to explore the impact of a range of potential cost levels ($1 to $4). However, a single POC test was reported to cost between $2 and $7, suggesting that a combined test may be more expensive. Further, the authors argued that they used the lower cost range for the combined test because "tests of higher cost were not cost effective". Failing to explore the potential impact of the higher costs has possibly biased the results in favour of POC testing, making it appear more cost-effective than it may actually be in practice. Discounting was not carried out despite the relatively long time horizon.

Other issues
The authors were able to compare their cost per HIV infection averted with other programmes in a similar area. They reported favourable cost-effectiveness in comparison with programmes to prevent HIV in sub-Saharan Africa, the prevention of mother-to-child transmission and voluntary counselling and testing. The issue of generalisability was discussed explicitly with the authors using sensitivity analyses, particularly relating to salary, to explore the impact of the results in different settings. The authors noted that their results are likely to apply to other communities with concentrated HIV epidemics. The authors presented the results very clearly and these related well to the scope and objectives of the study. Several limitations were discussed. For example, projecting the transmission of Ng/Ct together rather than separately, which may have reduced the accuracy of the projections, and the assumption that the intervention reached all FSWs when in fact some FSWs may not have been reached.

Implications of the study
The authors recommend the use of POC tests to help ensure the correct treatment of individuals. They also recommend further work to evaluate currently available POC tests.

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Bibliographic details
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Other publications of related interest
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