The cost effectiveness of opportunistic chlamydia screening in England

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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 study examined several screening strategies for genital chlamydial infection. Specifically, three main strategies were considered:

- offer an annual screen to women (strategy 1);
- offer an annual screen to women and an additional screen if they have changed their partner in the last 6 months (strategy 2); and
- offer an annual screen to women and men (strategy 3).

The strategies were simulated in different age groups (under 20, under 25, under 30, under 35, and under 40 years of age). A baseline strategy of no screening was also considered.

Type of intervention
Screening.

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

Study population
The study population comprised a hypothetical cohort of heterosexual men and women aged 16 to 44 years.

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

Dates to which data relate
Most of the clinical data were derived from studies published between 1992 and 2007. Some resource use data were obtained from studies published between 2004 and 2006. The price year was 2004.

Source of effectiveness data
The clinical data used to populate the decision model were:

- prevalence of disease (chlamydia infection);
- the rates of partner notification;
- the proportion of individuals attending a health care site;
the rates of infection and re-infection in the case of new partners;  
the rates of screening acceptance;  
efficacy of treatment following screening; and  
the risk of developing complications following acute chlamydial infection such as PID, EP, TBI, neonatal conjunctivitis and pneumonia, and epididymitis.

Modelling
Two models were used in the analysis. First, a published transmission dynamic model of chlamydia infection in a sexually active population (20,000 men and 20,000 women) was used to estimate the impact of the screening strategies on chlamydia prevalence. Second, a decision analytic model based on a decision tree was constructed in order to estimate both the clinical and economic impact of screening in terms of complications. Specifically, the model focused on symptomatic pelvic inflammatory disease (PID) and its related complications such as ectopic pregnancy (EP) and tubal factor infertility (TFI). Neonatal complications if mother was chlamydia positive at birth (such as neonatal conjunctivitis and pneumonia) were also modelled. A simplified schematic of the decision model was represented. The time horizon of the analysis was 10 years.

Sources searched to identify primary studies
There was little information on the sources used to derive the clinical data. Slightly more details were presented in the appendix. Some data were validated using statistics based on UK general practitioners. A few assumptions were also made.

Methods used to judge relevance and validity, and for extracting data
The approach used to identify relevant studies was not described. No systematic search for data was reported. Therefore, the primary studies might have been identified selectively, although UK sources appear to have been used when available.

Measure of benefits used in the economic analysis
The summary benefit measures were the number of quality-adjusted life-years (QALYs) in the cost-utility analysis and the number of major outcomes averted (MOAs) in the cost-effectiveness analysis. MOAs included PID, EP, TBI, neonatal conjunctivitis and pneumonia, and epididymitis. The authors stated that details on utility weights were reported in the appendix but little information was found. Both measures were estimated using the modelling approach and were discounted at an annual rate of 3.5%.

Direct costs
The viewpoint of the NHS was adopted. The categories of costs included in the analysis were the direct medical costs associated with screening (including partner notification), treatment of infection, and complications. A breakdown of cost items was reported only in the appendix. The unit costs were presented separately from some quantities of resources used in the online appendix, while macro-categories were reported in the main article. The estimation of costs was based on typical NHS sources such as Personal Social Services Research Unit, the British Medical Association and the Royal Pharmaceutical Society of Great Britain, and NHS Reference Costs. Some published studies were also used to derive key treatment costs. Resource use was mainly based on assumptions or published data, although details were presented in the appendix. Long-term costs were evaluated and an annual discount rate of 3.5% was applied. The price year was 2004. Costs estimated in previous time periods were inflated to 2004 values using the Hospital and Community Health Services Pay and Prices Index.

Statistical analysis of costs
The costs appear to have been treated deterministically in the base-case analysis.

**Indirect Costs**
Productivity costs were not considered.

**Currency**
UK pounds sterling (£).

**Sensitivity analysis**
Both a deterministic and a probabilistic sensitivity analysis were carried out to deal with the issue of uncertainty. The deterministic analysis investigated the robustness of model results to variations in key model assumptions such as discount rates, screening acceptance rate, effective partner notification rate, and single versus continuous screening. The probabilistic analysis assigned probabilistic distributions to all model inputs in a multivariate analysis. Details of the distributions assigned to all model parameters were given. Three scenarios for PID rates were considered: 1%, 10% and 30%.

**Estimated benefits used in the economic analysis**
In the scenario with a PID prevalence rate of 10% (most likely scenario), the total major outcomes and the QALYs lost in 20,000 men and 20,000 women over 10 years were, respectively, as follows:

1,392 and 65 with no screening;
883 and 39 with strategy 1 in the under 20 age group;
736 and 31 with strategy 2 in the under 20 age group;
673 and 29 with strategy 3 in the under 20 age group;
739 and 32 with strategy 1 in the under 25 age group;
645 and 28 with strategy 1 in the under 30 age group;
584 and 24 with strategy 2 in the under 25 age group;
468 and 19 with strategy 3 in the under 25 age group (NCSP strategy);
633 and 28 with strategy 1 in the under 35 age group;
610 and 28 with strategy 1 in the under 40 age group;
491 and 20 with strategy 2 in the under 30 age group;
400 and 17 with strategy 3 in the under 30 age group;
460 and 20 with strategy 2 in the under 35 age group;
363 and 16 with strategy 3 in the under 35 age group;
444 and 20 with strategy 2 in the under 40 age group;
343 and 15 with strategy 3 in the under 40 age group.
Cost results
In the scenario with a PID prevalence rate of 10%, the total costs in 20,000 men and 20,000 women over 10 years were as follows:

- 310,695 with no screening;
- 553,352 with strategy 1 in the under 20 age group;
- 771,367 with strategy 2 in the under 20 age group;
- 832,498 with strategy 3 in the under 20 age group;
- 918,213 with strategy 1 in the under 25 age group;
- 1,283,628 with strategy 1 in the under 30 age group;
- 1,462,494 with strategy 2 in the under 25 age group;
- 1,556,572 with strategy 3 in the under 25 age group (NCSP strategy);
- 1,666,599 with strategy 1 in the under 35 age group;
- 2,048,769 with strategy 1 in the under 40 age group;
- 2,157,585 with strategy 2 in the under 30 age group;
- 2,308,023 with strategy 3 in the under 30 age group;
- 2,869,275 with strategy 2 in the under 35 age group;
- 3,064,432 with strategy 3 in the under 35 age group;
- 3,582,115 with strategy 2 in the under 40 age group;
- 3,828,432 with strategy 3 in the under 40 age group.

Synthesis of costs and benefits
Incremental cost-effectiveness ratios and cost-utility ratios were calculated to combine the costs and benefits of the alternative strategies. Average ratios were also presented.

After excluding dominated strategies, in the scenario with a PID prevalence rate of 10%, the incremental cost per MOA and the incremental cost per QALY gained over the next less expensive strategy were, respectively, as follows:

- 477 and 9,204 with strategy 1 in the under 20 age group (versus no screening);
- 1,484 and 29,416 with strategy 2 in the under 20 age group (versus strategy 1, age group under 20);
- 959 and 24,103 with strategy 3 in the under 20 age group (versus strategy 2, age group under 20);
- 16,415 and 978,039 with strategy 1 in the under 30 age group (versus strategy 3, age group under 20);
- 2,928 and 44,109 with strategy 2 in the under 25 age group (versus strategy 1, age group under 30);
- 807 and 19,352 with strategy 3 in the under 25 age group (versus strategy 2, age group under 25);
- 11,059 and 302,328 with strategy 3 in the under 30 age group (versus strategy 3, age group under 25);
20,479 and 747,964 with strategy 3 in the under 35 age group (versus strategy 3, age group under 30; 39,230 and 1,938,410 with strategy 3 in the under 40 age group (versus strategy 1, age group under 35).

The rank order of screening scenarios was the same in the incremental analysis for all assumptions about PID progression.

When considering strategy 3 in the under 25 year age group (NCSP strategy), the sensitivity analysis showed that a low acceptance rate led to a higher cost-utility ratio compared with the baseline of 50% acceptance. Increasing the effective partner notification rate from 20% to 50% reduced the cost-utility ratio by about 10%, and offering men and women aged under 25 years a single screening test was more cost-effective than continuous screening. Changes in the discount rate did not substantially alter the results of the analysis. The most influential parameter of the model was the probability of cases progressing to PID.

The multivariate sensitivity analysis suggested that there was considerable uncertainty in the results of the analysis, even in the no screening scenario, particularly in the QALYs lost from chlamydia infection. Overall, strategy 1 in the under 20 year age group led to large incremental QALY gains and had a high probability of falling below 20,000 per QALY gained (at 10% PID progression).

Authors' conclusions
Annual screening tests offered to men and women aged under 20 years was likely to represent the most cost-effective strategy for chlamydia infection screening, especially in a scenario with pelvic inflammatory disease (PID) progression of at least 10%. However, the results of the probabilistic sensitivity analysis demonstrated the greatest uncertainty in the findings. This screening strategy was more cost-effective than the current strategy being implemented in the UK for chlamydia infection screening (i.e. annual screen to women and men aged younger than 25 years). The cost-effectiveness of this strategy could greatly improve increasing acceptance rates.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparators was clear in that all possible screening strategies were considered, including a no-screening strategy. Several age groups were included. The currently implemented screening policy was also considered. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness
The approach used to identify relevant sources of clinical data was not described. No systematic search for data was reported. In effect, the primary studies might have been identified selectively. Similarly, little information on the design and other characteristics of the primary studies was given. The methods of combining the primary estimates and the homogeneity among primary sources were not discussed. UK sources were used when available. All model clinical inputs were varied in the sensitivity analyses.

Validity of estimate of measure of benefit
Both a disease-specific and a generic measure of benefit were used in the analysis, and both were modelled. In particular, the use of QALYs was appropriate as they capture the impact of the interventions on two relevant dimensions of health, namely quality of life and survival. Discounting was appropriately performed and the impact of alternative discount rates (or no discounting) was investigated. Little information on the sources of the utility weights used to calculate QALYs was given.

Validity of estimate of costs
The analysis of the costs appears to have been consistent with the authors' stated perspective. Typical NHS sources were used to derive the cost data. Detailed information on resource use was presented in the appendix. The costs were presented as macro-categories in the main article, which limits the possibility of replicating the analysis in other settings. Appropriate discounting was applied. The price year was presented, which will facilitate reflation exercises in other time periods. Statistical analyses of costs were performed in the probabilistic sensitivity analysis. The authors stated that costs associated with false-positive or false-negative tests were not included in the analysis.
Other issues
The authors compared their findings with those from another dynamic model which had shown that screening might be cost-saving after 10 years. The authors explained the possible reasons for the discrepancies between the two studies, mainly related to some assumptions of the model. The issue of the generalisability of the study results to other settings was implicitly addressed in the sensitivity analysis, in which the issue of uncertainty was extensively investigated. In general, little information on the analysis was presented in the current publication since most of the details of the clinical and economic aspects of the economic evaluation were provided in an online appendix. However, the results of the cost-effectiveness and cost-utility analyses were presented extensively for the three main scenarios considered (PID rates). The authors provided a cost-effectiveness plane to better represent the results of the analysis.

Implications of the study
The study results suggest that an annual screening strategy for chlamydia infection offered to men and women younger than 20 years of age might be cost-effective.

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Subject indexing assigned by NLM

MeSH
Adult; Chlamydia Infections /economics /prevention & control; Chlamydia trachomatis; Contact Tracing; Cost-Benefit Analysis; Female; Great Britain; Humans; Male; Mass Screening /economics; Multivariate Analysis; Pelvic Inflammatory Disease /economics /prevention & control; Quality-Adjusted Life Years