Influence of epidemic phase on the cost effectiveness of a prevention intervention for sexually transmitted infection: an exploratory analysis

Chesson H W, White P J

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 a hypothetical programme for the prevention of sexually transmitted infections (STIs). The programme consisted of a public awareness campaign (delivered through the media) to increase the use of condoms. The programme was implemented at difference phases of the STI epidemic (i.e. early versus late).

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of exclusively heterosexual persons aged 16 to 35 years.

Setting
The setting was the community. The economic study was carried out in the USA.

Dates to which data relate
No dates for the clinical data and resource use information were given as most of these were based on assumptions about hypothetical costs and effects. The price year was not reported.

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

- the partnership probability of transmission,
- the average duration of infection,
- the number of high- and low-activity individuals infected in the first year of the STI epidemic,
- the increase in condom usage attributable to the intervention, and
- the subsequent reduction in the per-partnership probability of transmission.

Modelling
A published deterministic, compartmental model of STI transmission was used to simulate the clinical and economic impact of the STI prevention programme, implemented in either an early or late phase of the STI epidemic, in a
hypothetical cohort of 200,000 persons. The time horizon of the model was 40 years. The model population was divided into two groups, susceptible and infected. It was stratified by gender and into low- and high-activity groups with characteristic rates of sexual partner change. A description of the algorithms and the main assumptions of the model were given in an appendix to the paper.

**Sources searched to identify primary studies**
Clinical data were based on authors' assumptions. The authors stated that their assumptions about partnership probability of transmission and average duration of infection were consistent with estimates found in the literature for bacterial STIs such as syphilis, gonorrhoea and chlamydia.

**Methods used to judge relevance and validity, and for extracting data**
No specific procedure was used to derive authors' opinions.

**Measure of benefits used in the economic analysis**
The summary benefit measure was the number of STI cases averted with the programme. The benefits were discounted at an annual rate of 3%.

**Direct costs**
The cost/resource boundary of the analysis was not explicitly stated. Only the direct medical costs of the prevention programme and lifetime cost per case of treatment of the STI and its sequelae were included. The unit costs and the quantities of resources used were not presented separately. The costs and resource use appear to have been estimated on the basis of authors' assumptions. The authors stated that the lifetime cost per case of treatment of the STI and its sequelae was consistent with data found in the literature for gonorrhoea and chlamydia. The costs were discounted, which was appropriate given the long time horizon of the analysis, and an annual rate of 3% was used. The price year was not reported.

**Statistical analysis of costs**
Statistical analyses of the costs and quantities were not performed.

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

**Currency**
US dollars ($).

**Sensitivity analysis**
A deterministic univariate sensitivity analysis was carried out to assess how the cost-effectiveness of the programme would change when varying the parameters. Specifically, the discount rate, the per-partnership probability of transmission, the mixing parameter, the proportion of the population with a low rate of sexual partner change, the impact of the intervention, the annual cost of the intervention, and the direct medical costs per case of STI. A time horizon of 5 years was also considered. The authors set the alternative values.

**Estimated benefits used in the economic analysis**
In a cohort of 200,000 persons, over a 40-year time horizon, the expected number of STIs averted (implicitly in comparison with no intervention) was 268,004 with the earlier intervention (starting at year 0) and 91,828 with the later intervention (starting in year 20).
In a cohort of 200,000 persons, over a 5-year time horizon, the expected number of STIs averted (implicitly in comparison with no intervention) was 53,693 with the earlier intervention (starting at year 0) and 26,564 with the later intervention (starting in year 20).

**Cost results**

Net costs were calculated as the programme costs minus the treatment cost averted by the intervention.

In a cohort of 200,000 persons, over a 40-year time horizon, the discounted net costs of the intervention were $181.0 million with the earlier intervention (starting at year 0) and $65.2 million with the later intervention (starting at year 20).

In a cohort of 200,000 persons, over a 5-year time horizon, the discounted net costs of the intervention were $35.7 million with the earlier intervention (starting at year 0) and $20.4 million with the later intervention (starting at year 20).

**Synthesis of costs and benefits**

Average cost-effectiveness ratios (i.e. the average cost per STI case averted) were calculated in order to combine the costs and benefits of the alternative strategies.

The average cost per STI case averted was $675 with the earlier intervention and $710 with the later intervention. Thus, the intervention was more cost-effective when implemented in year 0 rather than in year 20.

A similar conclusion was reached when a 5-year time horizon was applied. An interesting result was that delaying the onset of the intervention from year 0 to year 1, or from year 1 to year 2, increased the cost-effectiveness ratio more substantially than delaying the onset of the intervention from year 10 to year 11, or year 11 to year 12.

The better cost-effectiveness profile of earlier intervention also held in the sensitivity analysis, although the cost-effectiveness ratios were slightly sensitive to changes in the mixing parameter, the proportion of the population in the group with low sexual activity, the impact of the intervention on the per-act probability of STI transmission, the annual cost of the intervention and the costs of STI treatment. However, no significant changes in the results of the analysis were observed.

**Authors’ conclusions**

A sustained, behaviour-change intervention for the prevention of sexually transmitted infections (STIs) was more cost-effective the earlier in the epidemic it was implemented. However, the absolute economic value of the STI prevention intervention was affected by factors other than the timing of the programme, such as the cost of intervention, the cost of STI treatment, and the effectiveness of the intervention.

**CRD COMMENTARY - Selection of comparators**

The rationale for the choice of the comparators was clear in that the STI epidemic phase in which the programme was implemented is key to the cost-effectiveness analysis. Therefore, the authors focused the analysis on the same programme initiated in different phases. Each programme was implicitly compared with a strategy of no intervention, which might represent the standard of care in several contexts. You should decide whether they are valid comparators in your own setting.

**Validity of estimate of measure of effectiveness**

The clinical estimates were based on authors' opinions and no specific procedure appears to have been used to derive these estimates. The use of assumptions usually represents a weak source of data, but the authors did investigate the issue of uncertainty surrounding these estimates in the sensitivity analysis.

**Validity of estimate of measure of benefit**
The summary benefit measure was specific to the disease considered in the study and will not be comparable with the benefits of other health care interventions. However, the number of cases averted is a common benefit of prevention programmes.

**Validity of estimate of costs**
The perspective adopted in the analysis of the costs was not clear. Only two macro-categories of costs were included in the analysis and a breakdown of the cost items was not given. The price year was not reported. This might limit the possibility of replicating the analysis in other settings. Statistical analyses of the costs were not performed. The costs were based on authors' opinions. However, the cost estimates were quite conservative, as a very high intervention cost was selected in order to ensure that the cost-effectiveness of the intervention would not be cost-saving in comparison with no intervention.

**Other issues**
The authors stated that their findings were consistent with the results from two cost-effectiveness analyses of prevention interventions for the human immunodeficiency virus. The issue of the generalisability of the study results to other settings was not addressed, although the use of sensitivity analyses enhances, to some extent, the external validity of the study. The clinical and economic data used as model inputs were based on authors' assumptions, but the authors stated that these estimates were consistent with published data on bacterial STIs such as syphilis, gonorrhoea and chlamydia. However, they also acknowledged that the main limitation of their analysis was the hypothetical nature of assumptions about the cost and effectiveness of the intervention. Further, a range of simplifying assumptions was made.

**Implications of the study**
The study results suggest that an early programme for the prevention of STIs might be cost-effective in some scenarios. The authors stated that it should be possible to draw more robust conclusions as soon as reliable estimates of some model inputs are obtained.

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**Other publications of related interest**
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