Estimated effectiveness and cost-effectiveness of federally funded prevention efforts on gonorrhoea rates in the United States, 1971-2003, under various assumptions about the impact of prevention funding

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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 investigated the impact of US federally funded prevention efforts on gonorrhoea rates in the USA. This intervention included disease surveillance and data management, clinical services for the diagnosis and treatment of sexually transmitted diseases (STDs), the provision of condoms, primary prevention counselling, partner services, and the implementation of community and individual behaviour change interventions. This intervention was compared with a scenario in which no federal funds were provided for gonorrhoea prevention.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised all citizens of the USA.

Setting
The study setting was the community. The economic analysis was conducted in the USA.

Dates to which data relate
The effectiveness data were derived from studies and reports conducted between 1999 and 2005. The price year was 2003.

Source of effectiveness data
The effectiveness data were derived from published data and US Centers for Disease Control and Prevention (CDC) reports.

Modelling
The author used a simple epidemiological model to estimate the gonorrhoea rates that might have occurred had there been no federal STD programme, and the cost-effectiveness of this programme.

Outcomes assessed in the review
The outcomes assessed were:
the adjustment for underreporting of gonorrhoea cases;
the percentage decrease in gonorrhoea rates associated with $1 per-capita prevention expenditure; and
the reported national gonorrhoea incidence.

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
Three primary studies were included in the review. The estimated impact per dollar of prevention funding on gonorrhoea incidence rates was derived from a published study on the effect of human immunodeficiency virus (HIV) and STD prevention funding allocated by CDC (Chesson et al. 2005, see ‘Other Publications of Related Interest’ below for bibliographic details). The reported gonorrhoea case numbers and rates were obtained from CDC’s annual surveillance report. The adjustment for underreporting of gonorrhoea cases was derived from another published study (Cates et al. 1999, see ‘Other Publications of Related Interest’ below for bibliographic details).

Methods of combining primary studies
Only one study was used to populate each individual parameter.

Investigation of differences between primary studies
Not relevant.

Results of the review
The adjustment for underreporting of gonorrhoea cases was 1.5 (range: 1 to 2).
The percentage decrease in gonorrhoea rate associated with $1 per-capita prevention expenditure was 13.3% (range: 5.3 to 18.6).
The author did not report the national gonorrhoea incidence rates used in the model as these varied by year.

Measure of benefits used in the economic analysis
The measure of benefits used was the number of gonorrhoea cases averted by federal prevention efforts.

Direct costs
The direct costs included in the analysis were those to the health care system and the CDC. For the health care system,
these were the medical costs of treating gonorrhoea, which included the average costs of diagnosis and treatment of acute infections and sequelae associated with untreated or inadequately treated infections. These costs were derived from a published study (Cates et al. 1999). Federal STD prevention expenditures between 1971 and 2003 were obtained from CDC records and were limited to general STD prevention funding awards and direct assistance from CDC to state and local health departments. Expenditure specifically targeted at HIV prevention, syphilis, infertility prevention and other special projects was not included. The author reported that prevention expenditures and averted medical costs were discounted forward to the base year of 2003 using an annual discount rate of 3%. The precise meaning of this is unclear, but we assume that the author intended it to mean that the costs were inflated by 3% a year, assuming that that was the average inflation rate. The author reported the incremental total costs.

**Statistical analysis of costs**
The costs were treated as point estimates (i.e. the data were deterministic).

**Indirect Costs**
The indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were conducted to determine how the results changed when the input values were varied. The author first conducted a series of one-way sensitivity analyses in which each input was varied once at a time, and then conducted two-way sensitivity analyses by varying two model inputs at the same time. Finally, a Monte Carlo simulation was conducted to examine how the results changed when four model inputs (i.e. adjusting for underreporting, the discount rate, the estimated impact per dollar of prevention funding, and the cost per case of gonorrhoea) were varied simultaneously.

**Estimated benefits used in the economic analysis**
Without prevention efforts from 1971 to 2003, the base-case analysis indicated that the reported gonorrhoea rates in 2003 would have been 476 per 100,000 population, compared with 116 per 100,000 population actually observed in 2003.

The model indicated that prevention efforts averted an estimated 32 million cases of gonorrhoea from 1971 to 2003.

**Cost results**
From 1971 to 2003, the federal STD prevention funding was $4.3 billion.

The savings generated from federal STD prevention funding in averted medical costs for gonorrhoea treatment was $8.1 billion between 1971 and 2003.

Therefore, the net cost of prevention activities (i.e. prevention funding minus averted medical costs) was $3.7 billion between 1971 and 2003.

**Synthesis of costs and benefits**
The costs and benefits were not combined as federal funding for gonorrhoea prevention was found to be more effective (i.e. averted gonorrhoea cases) and to generate savings when compared with no federal funding.

The results of the sensitivity analyses showed that the incremental cost per case of gonorrhoea averted varied from cost-
saving to $405, with the latter occurring when the adjustment for underreporting was set to 1.

The results of the Monte Carlo simulation showed that the incremental cost-effectiveness ratio was cost-saving in 73% of the estimations, less than $50 in 83% of the estimations, and less than $174 in 95% of the estimations, with a maximum value of $633 per case averted.

Authors' conclusions
Sexually transmitted disease (STD) prevention efforts would appear to be cost-saving when considering only the benefits of preventing gonorrhoea.

CRD COMMENTARY - Selection of comparators
The objective of the study was to compare the effects and costs of federal STD prevention activities on gonorrhoea prevention between 1971 and 2003. Consequently, the use of no federal expenditure for STD prevention activities as the comparator was appropriate. You should decide if the comparator used represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The author did not report whether a systematic review of the literature was undertaken to identify relevant research and minimise biases. As the model was very simple, requiring only a few model inputs, the author only used three primary studies to populate the model. These studies appear to have been appropriate and up-to-date. Further, the impact of variations in the base-case inputs was appropriately examined in sensitivity analyses.

Validity of estimate of measure of benefit
The estimate of benefits was modelled using a simple epidemiological model. This appears to have been appropriate for the study question.

Validity of estimate of costs
Although the author reported that the costs were estimated from a societal perspective, the indirect costs (i.e. productivity costs such as those due to early mortality or morbidity) were not included in the analysis. The perspective adopted in the analysis therefore appears to have been that of the CDC (which financed the STD prevention programme) and the health care system. All costs for this perspective appear to have been included in the analysis. The costs and the quantities were not reported separately, which will limit the generalisability of the author's results. The costs and expenditures were derived from published sources, with appropriate sensitivity analyses of the costs being conducted. The author talked about "discounting forward". We interpret this as adjusting for inflation, otherwise their precise meaning is unclear. If "discounting forward" is indeed adjusting for inflation, then no discounting for time preference was actually done. The price year was reported, which will aid any future inflation exercises.

Other issues
The author did not make appropriate comparisons of their results with those from other studies. However, the issue of generalisability to other settings was addressed through the sensitivity analyses. The author does not appear to have reported the results selectively and the conclusions reflected the scope of the analysis. The author reported a number of further limitations to the study. First, the estimated impact per dollar of prevention funding used in the study was derived from a study that only used CDC-allocated funds for HIV and STD prevention, rather than for gonorrhoea, and did not take other federal funds into consideration. Second, owing, to the uncertainty in the estimated impact per dollar of prevention funding, the true value was not captured in the sensitivity analysis. Finally, the benefits of federal funding on other infectious diseases, such as HIV, were not estimated.

Implications of the study
The author stated that if the benefits of preventing syphilis, chlamydia and other STDs were considered, the estimated effectiveness and cost-effectiveness of federally funded STD prevention efforts in the USA would be greater.

Source of funding
None stated.

Bibliographic details

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Other publications of related interest
Because readers are likely to encounter and assess individual publications, NHS EED abstracts reflect the original publication as it is written, as a stand-alone paper. Where NHS EED abstractors are able to identify positively that a publication is significantly linked to or informed by other publications, these will be referenced in the text of the abstract and their bibliographic details recorded here for information.


Chesson HW, Dee TS, Aral SO. AIDS mortality may have contributed to the decline in syphilis rates in the United States in the 1990s. Sex Transm Dis 2003;30:419-24.


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