Using economic threshold analysis to determine the intensity of HIV prevention services for HIV-seropositive persons

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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 author investigated the use of prevention services aimed at assisting people living with the human immunodeficiency virus (HIV) to avoid transmission to others. This intervention was compared with a no prevention strategy.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised HIV-seropositive individuals in the USA.

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

Dates to which data relate
The effectiveness data were derived from a review of studies published between 1999 and 2004. The cost data were derived from a study published in 1997. The price year was 2003.

Source of effectiveness data
The effectiveness data were derived from a review of published studies.

Modelling
The author estimated how much money would be spent per HIV-seropositive client on HIV prevention services and still be considered cost-saving to society in the USA at specified levels of HIV transmission and intervention effectiveness. The formula (given in the paper) was based on the numbers of HIV-seronegative partners with and without the intervention, the HIV transmission rate with and without the intervention, and the societal value of preventing one HIV transmission.

Outcomes assessed in the review
The outcomes assessed in the review were:

the annual HIV transmission rates in the US overall and for people unaware of their HIV-seropositivity, people aware of
their HIV-seropositive status and receiving counselling, and people aware of their HIV-seropositive status and not receiving counselling; and

the effectiveness of the intervention in reducing transmission rates.

**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**
The validity of the primary studies does not appear to have been assessed.

**Number of primary studies included**
Approximately 8 studies were included in the review.

**Methods of combining primary studies**
When different studies were found, these were combined using ranges (from lower estimate to higher estimate).

**Investigation of differences between primary studies**
The author did not report whether any differences between the studies were investigated.

**Results of the review**
The annual HIV transmission rate in the USA overall was 4%.

For people who were unaware of their HIV-seropositivity, the annual transmission rate was 11%.

For people who were aware of their positive status and had received counselling, the transmission rate was close to zero. However, for those not receiving sufficient counselling, or none at all, the transmission rate was estimated to be between 2 and 4%.

The effectiveness of the intervention in reducing the transmission rate was found to be in the order of 10 to 100%.

**Methods used to derive estimates of effectiveness**
As there was imprecise guidance in the literature for the exact number of partners, the author selected values that were illustrative.

**Estimates of effectiveness and key assumptions**
Therefore, in one scenario, the author assumed one HIV-seronegative partner both with and without the intervention. In a second scenario, he assumed one HIV-seronegative partner with the intervention and two partners without.
Measure of benefits used in the economic analysis
Monetary benefits were used in the economic analysis. To assess the value of preventing an HIV transmission, the author used the net present value of lifetime treatment costs for HIV, based on results from a published study. Benefits were also measured by the number of interventions, instead of intervention costs, by dividing the intervention cost threshold results by $58.55.

Direct costs
The direct costs to the health care system were considered in the analysis. Only the direct costs (savings) of preventing one HIV transmission were included in the analysis (including highly-active-antiretroviral therapy plus all other HIV-related care and testing). These costs were the ones used as monetary benefits. Lifetime treatment costs for HIV were adjusted to 2003 US$ using the medical care component of the Consumer Price Index. The lifetime treatment costs for HIV were converted into net present value to represent one-year 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 by varying the number of partners.

Estimated benefits used in the economic analysis
To estimate how much money would be spent per HIV-seropositive client on HIV prevention services and still be considered cost-saving to society in the USA, the author varied the levels of HIV transmission and intervention effectiveness.

The effectiveness of the interventions was varied between 10 and 100%, in 10% increments. The transmission rates were varied between 0.4% and 12.0% (i.e. 0.4, 2.0, 4.0, 8.0 and 12.0%).

Cost results
The net present value of lifetime treatment costs for HIV was $19,556 per patient in 2003.

Synthesis of costs and benefits
The author estimated how much money would be spent per HIV-seropositive client on HIV prevention services and still be considered cost-saving to society in the USA at specified levels of HIV transmission and intervention effectiveness. The formula (given in the paper) was based on the numbers of HIV-seronegative partners with and without the intervention, the HIV transmission rate with and without the intervention, and the societal value of preventing one HIV transmission.

The results showed that, with an intervention targeted at one HIV-seronegative partner with and without an intervention, with an annual HIV transmission rate of 4.0% and effectiveness of 70% (i.e. 70% reduction in HIV transmission rate with the intervention), an intervention that cost $547 (or took 9 counselling sessions per year) would be just cost-saving. At the extreme, with an annual HIV transmission rate of 0.4% and very low effectiveness (10%), an intervention would
only be cost saving if it cost $8 or less. At the other extreme, with a transmission rate of 12.0% and effectiveness of 100%, the intervention would have to cost $2,346 (or take 40 counselling sessions per year) to be cost-saving.

The results showed that, with an intervention targeted at one HIV-seronegative partner with the intervention and two partners without, with an annual HIV transmission rate of 4.0% and effectiveness of 70% (i.e. 70% reduction in HIV transmission rate with the intervention), an intervention that cost $1,329 (or took 23 counselling sessions per year) would be just cost-saving. At the extreme, with an annual HIV transmission rate of 0.4% and very low effectiveness (10%), an intervention would only be cost saving if it cost $86 or less. At the other extreme, with a transmission rate of 12.0% and effectiveness of 100%, the intervention would have to cost $4,691 (or take 80 counselling sessions per year) to be cost-saving.

**Authors' conclusions**

Intensive prevention interventions for persons living with the human immunodeficiency virus (HIV) may be cost-saving to society.

**CRD COMMENTARY - Selection of comparators**

Although no explicit justification was given for using no prevention services aimed at assisting people living with HIV to avoid transmission to others as a comparator, it would appear that this intervention was common practice in the author's settings. You should decide if this intervention represents current practice in your own setting.

**Validity of estimate of measure of effectiveness**

To estimate how much money would be spent per HIV-seropositive client on HIV prevention services and still be considered cost-saving to society in the USA at specified levels of HIV transmission and intervention effectiveness, the author varied these using ranges obtained from the published literature. The author did not report how these published studies were identified or if a systematic review of the literature was undertaken. He did not report in detail the methodology used in the review. For example, he did not report the search strategy used, the dates to which the search related, or any other inclusion criteria. However, extensive sensitivity analyses were performed to test the effects of varying the parameter estimates over plausible ranges obtained from the literature.

**Validity of estimate of measure of benefit**

The author estimated how much money would be spent per HIV-seropositive client on HIV prevention services using a cost-benefit analysis from a societal perspective. However, the prevention of one case of HIV was only valued as the costs of medical treatment. It did not include, for example, the willingness of society to pay to avoid or prevent one case of HIV. Consequently, from a societal perspective, the author’s estimated cost threshold for prevention services would be lower than if these costs had been included (i.e. it will bias against prevention services, as the intervention will have to cost less to be considered cost-saving at different levels of effectiveness and transmission rates).

**Validity of estimate of costs**

Not all the costs relevant to the societal perspective adopted were included in the analysis. The author did not include the production losses associated with HIV morbidity and mortality. As a result of these omissions, it is very likely that the author's estimated cost threshold for prevention services would be lower than if these costs had been included (i.e. it will bias against prevention services, as the intervention will have to cost less to be considered cost-saving at different levels of effectiveness and transmission rates). The only costs included in the analysis were those of treating HIV, which were derived from a published study. These costs were converted into net present value costs, but the author did not report the discount rate used. Very limited sensitivity analyses were undertaken, which will limit the generalisability of the author’s results. The price year was reported, which will aid any future inflation exercises.

**Other issues**

The author reported that there has been very little attention paid to the economic analysis of HIV prevention
interventions for persons living with HIV. The only other study he reported used the same methods as the present one. The issue of generalisability to other settings was not directly addressed. The author does not appear to have presented his results selectively and his conclusions reflected the scope of the analysis by stressing the uncertainty surrounding the input parameters. The author reported further limitations to his study. For example, the input parameters contained uncertainty and all had a major impact on the threshold results. In addition, the parameter values were specific to the USA, which will limit generalisability to other settings.

**Implications of the study**
The author stated "even with considerable uncertainty in input parameters, an economic threshold analysis framework can yield useful insights for guiding the selection of intensity of HIV prevention services for people living with HIV".

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
16260910

**Other publications of related interest**


**Indexing Status**
Subject indexing assigned by NLM

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