Economic evaluation of HIV risk reduction intervention in African-American male adolescents
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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 comparison of an intensive 1-day cognitive-behavioural HIV risk-reduction intervention, with a career opportunities workshop, to reduce sexual risk taking in African-American male adolescents.

Type of intervention
Primary prevention.

Economic study type
Cost-utility analysis.

Study population
The study population comprised African-American male adolescents at risk of HIV infection. The study sample consisted of those who were enrolled in a randomised clinical controlled trial of the intervention. The mean age was 14.64 years. The participants were recruited from the general population and from an outpatient clinic. The study did not report any further inclusion or exclusion criteria used in either the trial or the evaluation.

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

Dates to which data relate
The effectiveness and resource use data were obtained from a single study carried out in 1988 (see Other Publications of Related Interest). The costs of the intervention were adjusted to 1997 US dollars.

Source of effectiveness data
The effectiveness data were based on a review and synthesis of completed studies.

Modelling
A mathematical model was developed. This estimated the number of infections expected in each condition from the reported mean changes in sexual behaviour.

Outcomes assessed in the review
The input parameters for the model were:

the number of intervention participants;
the duration of the effectiveness of the intervention;
HIV prevalence among males in the community;
HIV prevalence among females in the community;
the probability of transmission for receptive vaginal intercourse;
the probability of transmission for insertive vaginal intercourse;
the probability of transmission for receptive anal intercourse;
the probability of transmission for insertive anal intercourse; and
the effectiveness of condoms.

Study designs and other criteria for inclusion in the review
The model mainly used the data from a single randomised controlled trial of the intervention. The review also included other studies. The inclusion criteria for the studies used in the review were 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 18 primary studies were included in the review.

Methods of combining primary studies
Not reported.

Investigation of differences between primary studies
Not reported. However, the authors did state that two studies were excluded from the review because the patient population (homeless and gay people) was irrelevant to the study.

Results of the review
The baseline values (sensitivity analysis values in parenthesis) of the parameters used in the model were as follows:

the number of intervention participants was 85;
the duration of the intervention effectiveness was 12 months (6 months, 18 months);
HIV prevalence among males in the community was 0.6% (0.1%, 1%);
HIV prevalence among females in the community was 0.6% (0.1%, 2.5%);

the probability of transmission for receptive vaginal intercourse was 0.0014 (0.0010, 0.0018);

the probability of transmission for insertive vaginal intercourse was 0.0006 (0.0004, 0.0008);

the probability of transmission for receptive anal intercourse was 0.02 (0.015, 0.025);

the probability of transmission for insertive anal intercourse was 0.0006 (0.0004, 0.0008); and

the condom effectiveness was 90% for the intervention group and 80% for the control group (80%, 90%).

**Methods used to derive estimates of effectiveness**

The estimates of effectiveness for the duration of effectiveness and the probability of transmission for insertive anal intercourse were derived from the authors' assumptions.

**Estimates of effectiveness and key assumptions**

The duration of effectiveness (12 months) and the probability of transmission for insertive anal intercourse (0.0006) were estimated, rather than obtained from the published literature. These data augmented the data used in the review for the model. The key assumptions used in these estimates were not reported.

**Measure of benefits used in the economic analysis**

The measures of benefit used in the economic analysis were the number of HIV infections averted and the number of quality-adjusted life-years (QALYs). The number of infections averted was defined as the difference between the expected number of infections and those reported at follow-up in a published study. The estimated number was derived from the sexual behaviour reported by the participants at baseline. A mathematical model was used to translate the reported mean changes in sexual behaviour into an estimate of the number of infections expected.

The change in QALYs was estimated for each infection averted. A published analysis suggested that a person who was infected with HIV at age 15 would lose a total of 34.21 QALYs by 65 years of age. This estimate assumed that the person received standard medical treatment. The health state valuation method was not reported.

**Direct costs**

The resource quantities and the unit costs were reported separately. The authors reported that all the direct costs were included, regardless of who paid or benefited. The direct costs were related to personnel (sessions, training, recruiting), staff transportation (sessions, training), materials, facilities, and the participants. The quantities and costs were estimated using actual data from a published study. The authors did not report the source of the unit cost data. However, they did report the total costs of the intervention and the average cost per participant. The time horizon for the study was lifetime. All the costs were discounted at an annual rate of 3% in the base-case analysis. The cost data referred to 1997. The costs were estimated from a study conducted in 1988, and were adjusted for inflation using the US Federal Government's Consumer Price Index.

**Statistical analysis of costs**

The authors did not report a statistical analysis of costs.

**Indirect Costs**

The authors did not report the indirect costs despite reporting that the analysis was conducted from a societal perspective.
Currency
US dollars ($). No currency conversions were reported.

Sensitivity analysis
One-way sensitivity analyses were conducted for the following input parameters for the model:

- the probability of transmission (plus and minus 25%);
- the condom effectiveness (80%, 90%);
- the duration of the intervention effectiveness (6 months, 18 months);
- a subsample of adolescents who were sexually active at baseline;
- the treatment scenario (low cost, high cost);
- the discount rate (0%, 5%); and
- the intervention costs (excluding training costs, excluding training and participant costs).

Estimated benefits used in the economic analysis
For the full-study sample, a total of 0.008 infections were averted and 0.106 QALYs were saved.

For the subsample of adolescents who were classified as being sexually active at baseline, a total of 0.006 infections were averted and 0.080 QALYs were saved.

Cost results
The total cost of the intervention was $7,548 for the full sample. This corresponded to a cost of approximately $89 per participant.

The total cost of the intervention was $3,374 for the subsample of adolescents who were classified as being sexually active at baseline. This corresponded to a cost of approximately $89 per participant.

The authors did not report the total cost of the control group. The savings in medical care were $1,478 for the full sample, and $1,111 for the subsample.

Synthesis of costs and benefits
The authors calculated the cost-effectiveness and cost-utility ratios.

For the full sample, the cost-effectiveness ratio was $996,619 and the cost-utility ratio was $57,327.

For the subsample, the cost-effectiveness ratio was $592,987 and the cost-utility ratio was $28,455.

The sensitivity analysis showed that the results of the baseline analysis were not sensitive to the transmission probabilities, condom effectiveness, the medical care treatment situation or the discount rate. However, the results were sensitive to the presumed duration of intervention effectiveness. If the duration of effectiveness was changed to 6 months, the estimated cost-utility ratio became $132,000/QALY, and if it was changed to 18 months, the estimated cost-utility ratio became $33,000/QALY.

Authors' conclusions
The authors concluded that an HIV-prevention intervention was moderately cost-effective in comparison with other
health care programmes. The authors suggested that selective implementation of the intervention in high-HIV prevalence communities, and with sexually-active youth, could enhance cost-effectiveness.

CRD COMMENTARY - Selection of comparators
The authors did not provide an explicit justification for the comparator. It would appear to have been chosen to represent the effect of a placebo intervention, which was described as a career opportunities workshop. You should decide if this is a widely used or appropriate approach in your own setting.

Validity of estimate of measure of effectiveness
A systematic search or review of the literature was not undertaken. The study was based mainly on the results of a single randomised controlled trial conducted in 1988, which was augmented by data from other published studies.

It was unclear whether the estimates of effectiveness were combined. The authors seem to have used data from the available studies selectively. Generally, the authors did not seem to consider the impact of differences between the primary studies when estimating the effectiveness. The one exception was that they excluded two studies that they felt did not use a study population with comparable characteristics to that used in the model. The authors did not report the methods used to derive the estimates of effectiveness clearly. In some instances, the estimates for effectiveness were guessed and not derived from the published data. The authors did not justify their assumptions.

The sensitivity analysis showed that the results of the model were highly sensitive to the estimate for the duration of benefit. However, the authors did not discuss the implications of the potential impact of this on the robustness of the model's findings.

Validity of estimate of measure of benefit
The estimation of benefits (QALYs) was derived from the number of HIV infections averted using a mathematical model, which seemed to be an appropriate method. The authors did not provide adequate detail of the methods used to derive the health state valuations. Neither did they provide sufficient detail of the individuals used to provide the health state valuations. It was not possible to assess whether the utility values used in this model accurately reflect the potential impact on the chosen study population.

Validity of estimate of costs
The study adopted a societal perspective but omitted a valuation of the indirect costs, which value lost productivity. In terms of the direct costs, all the relevant costs appear to have been included in the analysis. The costs and quantities were reported separately. The resource use data were taken from a single study conducted in 1988. The paper abstracted here was published in 2000 and reported the costs using 1997 prices. It is questionable whether resource use from practice twenty years ago accurately reflects current practice in terms of the management of HIV.

No statistical analysis of the quantities was performed. The authors did not report the source of the unit costs, but they appear to have been taken from the authors' own setting. The costs were discounted at a 3% rate, which is the rate recommended for the USA. A discount rate of 6% is recommended in the UK. The authors explored the potential impact of different discount rates in the sensitivity analysis. The results of the model were not sensitive to the choice of discount rate.

Other issues
The authors compared their results with other studies and made appropriate comparisons. The issue of generalisability was addressed in the sensitivity analysis. The authors did not present their results selectively. The study enrolled African-American adolescent males, and also evaluated a subsample of adolescents who were sexually active at baseline. The authors discussed the need to conduct studies in other high-risk groups.

The authors reported a number of limitations to their study. They stated that the clinical study was conducted in 1988. It
is possible that the changing HIV-infection environment would affect the willingness of adolescents to engage in risk behaviours, and their receptivity to learning strategies to lower their risk of infection. The risk reduction messages, and the motivational and skill-building techniques, may need to be updated.

The authors stated that the cost of implementing the programme was likely to depend on local circumstances. The cost of conducting the intervention in the 'field' may differ from the cost of implementing it as a research trial. The small number of infections averted in this study may be caused by the small sample size. Additional limitations included the retrospective collection of cost data, the need to estimate key epidemiological parameters, and the use of self-reported sexual behaviour. The benefits of the intervention in terms of reducing the incidence of other sexually-transmitted diseases, and in preventing unplanned pregnancies, were not evaluated.

**Implications of the study**
The authors reported that this study indicated that interventions to reduce the risk of HIV infections in heterosexual African-American male adolescents can be cost-effective. They suggested that additional studies are required to assess the cost-effectiveness of sexual risk reduction interventions for vulnerable young people. These include runaway and homeless adolescents, patients at sexually-transmitted disease clinics, young men who have sex with men, and African-American and other ethnic minority females who are at high risk of HIV infection.

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**Other publications of related interest**

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