HIV transmission and the cost-effectiveness of methadone maintenance
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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
Methadone maintenance treatment for heroin addiction. The comparator was no methadone maintenance (MMT). No details on the dosage were provided, as this varies between patients.

Type of intervention
Treatment and primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Two patient groups were studied. The study population group was a cross section of the general population aged 18-44, but was divided into two groups: those living in a high prevalence community and those living in a low prevalence community. Each individual was placed into one of three risk groups: Non-injection drug user (may or may not use other drugs), injection drug user with MMT and injection drug user without MMT.

Setting
In the community, in the USA.

Dates to which data relate
Effectiveness data were obtained from sources between 1987 and 1998. Costs for non-HIV care and HIV care were from studies between 1994 and 1998. These were adjusted for inflation. Prices were 1998US dollars.

Source of effectiveness data
Effectiveness data were taken from a review/synthesis of completed studies published between 1987 and 1998, and some effectiveness data were based on estimates and assumptions.

Modelling
A dynamic model was developed, with 9 different states (3 different health states: HIV-, HIV+ and AIDS, and 3 risk states described above). Transition probabilities were used to show the number of expected HIV transmissions. The model was used to analyse the extra benefits arising from preventing one person from contracting HIV, since this individual would not pass on the virus to others.

Outcomes assessed in the review
The review assessed the proportion of people in the population who have contracted the HIV virus, have AIDS or have died as a result of AIDS. This was simulated by the use of parameters in the model including initial HIV and AIDS
prevalence, sexual behaviour, drug injection behaviour, HIV transmission rates and disease progression rates. The quality of life was then measured, using quality-adjusted life years (QALYs) as an outcome measurement.

**Study designs and other criteria for inclusion in the review**
Clinical and observational studies were used to determine the model's parameters.

**Sources searched to identify primary studies**
The sources searched to identify primary studies were not stated.

**Criteria used to ensure the validity of primary studies**
The criteria used to ensure the validity of primary sources were not stated.

**Methods used to judge relevance and validity, and for extracting data**
The methods used to judge relevance, validity when extracting data were not stated.

**Number of primary studies included**
In excess of 70 primary studies were considered in determining the effectiveness evidence. These are reported in detail in Table 1 in the original paper.

**Methods of combining primary studies**
A narrative method was employed. The authors chose values near to the average of the reported range.

**Investigation of differences between primary studies**
An investigation of differences between primary studies was not made.

**Results of the review**
Disease progression results showed that the mean time from initial infection to AIDS for both non-injection drug users and injection drug users not in MMT was 11.5 years. For injection drug users in MMT this was 12.2 years. The mean time from AIDS to death for all individuals was 2.6 years.

The probability of HIV transmission per sexual partner with HIV (not AIDS) was 0.05, and with AIDS was 0.11.

Probability of HIV transmission per risky needle injection was 0.005 (sensitivity analysis was performed between values of 0.001 and 0.01).

The full list of parameters and values is presented in Table 1 of the original paper, whilst the list of sensitivity analysis maximum and minimum values is in Table 3.

**Measure of benefits used in the economic analysis**
The main benefit measure in the study was QALYs gained. An untreated injection drug user carried 0.8 QALYs per year, whilst an individual in MMT was assigned 0.9 QALYs per year. These values were elicited by a self assessed study published in the literature. HIV (without AIDS) carried a utility of 0.9 QALYs, and with AIDS this was 0.53 QALYs. These values were taken from another study. Benefits were discounted at 3%

**Direct costs**
All health care costs were considered, whether for HIV care or non-HIV care, as well as the cost for methadone maintenance. The cost of MMT was derived from a study of 600 MMT programmes. Full details of the cost calculations are provided in another paper by the same authors (in press at the time of writing). The health care costs were derived from sources between 1994 and 1998 and were given in 1998 US dollars after adjusting for inflation. Direct costs were discounted at 3% since the time horizon was 10 years. Quantities and costs were reported separately. It was assumed that the extra MMT programmes were as costly as the existing ones.

**Indirect Costs**

No indirect costs were considered in the model.

**Currency**

US dollars ($).

**Sensitivity analysis**

Univariate sensitivity analysis was performed on key parameters, and those parameters for which estimations and assumptions had been used. These included death rates, treatment completion, sexual behaviour, drug injection behaviour, HIV transmission rates, QALY values for health states and costs. A full summary of the sensitivity analysis is provided in Table 3 of the paper.

**Estimated benefits used in the economic analysis**

In the high prevalence community, the 10% expansion of MMT programmes resulted in 264 (discounted) averted HIV infections (reducing HIV prevalence by 0.022%). This resulted in a gain of 1,300 QALYs over the 10 year period (discounted). In the low prevalence community, the 10% expansion of MMT programmes resulted in 34 (discounted) averted HIV infections (reducing HIV prevalence by 0.003%). This resulted in a gain of 301 QALYs over the 10 year period (discounted). No side-effects were considered in the analysis.

**Cost results**

For the high prevalence community, the total cost of expanding MMT by 10% was $17,000,000 (discounted at 3%) over 10 years. After reductions in HIV care costs were considered, the incremental cost of this programme was $10,900,000 (discounted). For the low prevalence community, the total cost of expanding MMT by 10% was $4,800,000 (discounted at 3%) over 10 years. After reductions in HIV care costs were considered, the incremental cost of this programme was $3,300,000 (discounted).

**Synthesis of costs and benefits**

Results are reported as the cost per QALY gained. In the high prevalence community, base rate values suggested that the cost per QALY gained was $8,200 whilst in the low prevalence community, the cost was $10,900 per QALY gained.

Table 2 in the paper shows how modified quality of life, cost and effectiveness assumptions affect these results. These results were reasonably sensitive to the cost of methadone maintenance, the fraction of injection drug users leaving MMT who quit drug use, the fraction of injections that were shared and non-HIV related health care costs.

The model's results were fairly robust to such parameters as condom use among drug users, reduction in the number of sexual partners for drug users in MMT, the magnitude of the expansion of MMT and the discount rate.

All cost-effectiveness ratios were less than $20,000 per QALY gained, within the sensitivity analysis boundaries.

The authors noted that even if no value whatsoever were placed on the quality of life of an injection drug user (i.e. zero QALYs), the cost per QALY gained was $14,100 in the high and $15,600 in the low prevalence communities.
Since the results were sensitive to the cost of methadone maintenance, some discussion centred on the possibility that the model over or underestimated this cost.

Authors’ conclusions
The authors stated that, since any cost-effectiveness ratio below $33,000 per QALY gained can be considered cost-effective (from another publication), then it is recommended that methadone maintenance is expanded in both high and low prevalence areas.

CRD COMMENTARY - Selection of comparators
The expansion of MMT was compared to keeping the capacity the same. Other magnitudes of expansion were considered, including the possibility that incremental MMT slots were more costly and less effective than existing ones.

Validity of estimate of measure of effectiveness
The dynamic nature of the model has allowed the study to capture the effects of preventing one HIV infection resulting in knock on effects.

Validity of estimate of measure of benefit
Relevant measures of benefits were used and were based on a comprehensive literature base, although it is not clear if the literature survey was fully inclusive as details of the search strategy were not provided. A major issue was the valuation of the quality of life of an injection drug user. Many people claim that these individuals have a far lower quality of life, since they are more likely to suffer from psychological and physical illnesses. Sensitivity analysis showed that the programme was still cost-effective for all QALY values between zero and one.

Validity of estimate of costs
All relevant costs were included. However, no indirect costs were reported in the study (for example, travelling costs to receive MMT).

Other issues
One other major factor which may have influenced the results was the effect of cocaine injection. This was omitted due the poor information available. If patients in MMT were also injecting cocaine, then the MMT may not reduce their risky sexual and injection behaviour (since they would continue to inject cocaine). Therefore, the benefits reported in the study may be overstated.

Implications of the study
Whilst the programme of expanding MMT by 10% has been shown in the paper to be cost-effective, there are many other alternative programmes aimed at reducing HIV transmission (promotion increasing condom use for example). It is important that these alternative programmes are compared in order to find the most cost-effective method of preventing HIV incidence and transmission.

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Bibliographic details

PubMedID
10897189

Other publications of related interest

(2) Owens D K, Cardinalli A B, Nease R F J. Physicians' assessments of the utility of health states associated with human immunodeficiency virus (HIV) and hepatitis B virus (HBV) infection. Quality of Life Research 1997;6(1):77-86.

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