The cost effectiveness of a single-dose nevirapine regimen to mother and infant to reduce vertical HIV-1 transmission in sub-Saharan Africa


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 authors considered treatments to reduce the vertical transmission of human immunodeficiency virus type 1 (HIV-1) from mother to child. The treatments considered include an "ultra short-course" regimen of nevirapine (NVP) and zidovudine (AZT). NVP consisted of a single 200-mg dose to the mother at the onset of labour and a 2-mg/kg dose to the infant within 72 hours of birth. AZT consisted of 600 mg orally to the mother at the onset of labour and 300 mg every 3 hours until delivery, followed by 4 mg/kg orally, twice daily, to the infant for 7 days after birth. The analysis also compared "other short-course antiretroviral (ARV) regimens".

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population consisted of pregnant women in sub-Saharan Africa where breast-feeding was the norm.

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

Dates to which data relate
The effectiveness data were taken from the HIVNET 012 trial and a meta-analysis, both of which were published in 1999. The dates for the estimation of all costs were not provided. However, some of the costs related to studies published between 1995 and 1998. A price year was not given.

Source of effectiveness data
The majority of the effectiveness data were taken from a single study (the HIVNET 012 trial). However, the data were supplemented by a published meta-analysis. Overall, therefore, the effectiveness data were taken from a review and synthesis of completed studies.

Modelling
A "computer-based model" was used to assess the cost-effectiveness for a cohort of 20,000 hypothetical pregnant women. No further details of the model were provided.

Outcomes assessed in the review
The outcomes relevant to the review were perinatal, early postnatal and late postnatal risk of transmission.

**Study designs and other criteria for inclusion in the review**
Not stated. The authors appear to have selected information from the literature as necessary.

**Sources searched to identify primary studies**
Not stated.

**Criteria used to ensure the validity of primary studies**
Not stated.

**Methods used to judge relevance and validity, and for extracting data**
Not stated.

**Number of primary studies included**
The authors used two primary studies in their review, the HIVNET trial and a published meta-analysis.

**Methods of combining primary studies**
The results from the primary studies were not combined. The HIVNET trial was used to provide estimates of the perinatal and early postnatal risk of transmission. The meta-analysis was used to provide an estimate of the postnatal risk of transmission.

**Investigation of differences between primary studies**
Not reported.

**Results of the review**
The perinatal and early postnatal risk of transmission was found to be 25.1%.

The late postnatal (2.5 - 24 months) risk of transmission was found to be 7.4% of those uninfected at 2.5 months.

**Measure of benefits used in the economic analysis**
The number of cases averted and the number of disability-adjusted life-years (DALYs) associated with drug treatment were used as summary measures of benefit in the economic analysis. No details were provided about the valuation techniques used to estimate the DALYs.

**Direct costs**
Discounting was carried out and was relevant since the authors estimated the lifetime costs of treating HIV-positive children. However, the authors stated that to adopt a conservative approach they set the incremental treatment costs of HIV-positive children to zero. Therefore, in effect, the authors only estimated the immediate treatment costs and discounting was not required. The costs were reported separately from the quantities. The authors focused their costing analysis on the cost of NVP, the cost of voluntary counselling and testing (VCT) per woman, and the costs of treating HIV-positive children. These costs enabled the authors to estimate the costs of targeted treatment and universal treatment.

The costs were estimated on the basis of actual data and reviews of the literature. The cost of NVP was based on the
wholesale list price of NVP at the Johns Hopkins Hospital Pharmacy in Baltimore (MD), USA. The costs of VCT were derived from published estimates. The quantities were estimated from the results of the authors’ model involving 20,000 pregnant women. The dates of the price/cost measurements were not clear from the analysis. A price year was not stated.

**Statistical analysis of costs**
No statistical analysis of the costs was reported.

**Indirect Costs**
The indirect costs were not estimated, as the authors were interested in the perspective of the public sector payer.

**Currency**
A currency was not explicitly stated, although the costs appear to have been estimated in US dollars ($).

**Sensitivity analysis**
A sensitivity analysis was reported as being carried out on the prevalence of HIV-1 (3% - 40%). The methods and rationale were not stated.

**Estimated benefits used in the economic analysis**
Under universal treatment with a prevalence of 30%, the HIVNET 012 regimen averted 603 cases and generated $15,862 DALYs.

Under universal treatment with a prevalence of 15%, the HIVNET 012 regimen averted 302 cases. The number of DALYs generated was not stated.

Under targeted treatment with a prevalence of 30%, the HIVNET 012 regimen averted 476 cases. The number of DALYs generated was not stated.

Under targeted treatment with a prevalence of 15%, the HIVNET 012 regimen averted 246 cases. The number of DALYs generated was not stated.

It was not clear from the analysis whether these benefits were benefits beyond those provided by AZT, or beyond those provided by placebo, or whether no direct comparison was made.

**Cost results**
Under universal treatment with a prevalence of 15 or 30%, the HIVNET 012 regimen cost $83,300.

Under targeted treatment with a prevalence of 30%, the HIVNET 012 regimen cost $141,900.

Under targeted treatment with a prevalence of 15%, the HIVNET 012 regimen cost $124,500.

It was not clear from the analysis whether these costs were the costs of the HIVNET regimen alone, or were incremental to the costs of treatment with AZT.

**Synthesis of costs and benefits**
Under universal treatment with a prevalence of 30%, the HIVNET 012 regimen cost $138 per case averted and $5.25 per DALY.

Under universal treatment with a prevalence of 15%, the HIVNET 012 regimen cost $276 per case averted and $10.51
per DALY.

Under targeted treatment with a prevalence of 30%, the HIVNET 012 regimen cost $298 per case averted and $11.29 per DALY.

Under targeted treatment with a prevalence of 15%, the HIVNET 012 regimen cost $506 per case averted and $19.18 per DALY.

It was not clear from the analysis whether this synthesis of the costs and benefits was for the HIVNET regimen alone, or incremental to the costs of treatment with AZT.

The authors reported that the "sensitivity analyses indicated that the high cost-effectiveness of HIVNET 012 is robust under a wide range of input values".

The authors also mentioned that the higher cost-effectiveness of universal treatment was sensitive to the costs of NVP, the costs of VCT, and the assumption that there were no external benefits of VCT in reducing horizontal HIV transmission. Details of the ranges for these sensitivity analyses were not reported.

**Authors' conclusions**

When prevalence "exceeds 3% the universal HIVNET 012 regimen is likely to be as costs-effective as other well-accepted public health interventions".

**CRD COMMENTARY - Selection of comparators**

The comparators discussed at the outset were relevant to the study question, which concerned treatments for preventing the vertical transmission of HIV-1. AZT was justified as a comparator, as it had not been assessed. It was not clear which, if any, of the alternatives represented common practice in the authors setting.

**Validity of estimate of measure of effectiveness**

In the analysis that followed it was not clear whether AZT was actually used as a comparator. This creates some ambiguity when interpreting the results presented by the authors. The authors did not state that a systematic review was being carried out. The effectiveness results were mainly taken from a single clinical trial, and were selectively supplemented with data from published literature. The authors did not examine potential differences between the estimates of primary studies. These features of the analysis make it difficult to assess objectively the validity of the effectiveness data.

**Validity of estimate of measure of benefit**

The estimation of benefits was obtained directly from the effectiveness study to estimate the cases averted, and was modelled to obtain the DALYs. No details of the model were provided. The authors did not discuss the instrument used to derive the measure of DALYs.

**Validity of estimate of costs**

The authors adopted the perspective of the public sector payer. All the categories of cost relevant to this perspective were included in the analysis. However, the authors made the strong assumption that there was no difference in treatment costs between HIV-positive and HIV-negative children. Altering this assumption to account for cost differences may have improved the cost-effectiveness of the HIVNET regime. The costs were reported separately from the quantities, although the quantities themselves were not reported. The costs were taken from published literature and some sensitivity analyses were carried out.

**Other issues**
The authors made appropriate comparisons of their findings with those from other studies by providing estimates of the cost per DALY for alternative treatments. The issue of generalisability of the results was not discussed. It was unclear whether the authors may have presented some of their results selectively. The authors’ conclusions, however, accurately reflected the scope of their analysis. They stated that “the NVP regimen represents a deliverable and cost-effective regimen for preventing mother-to-child transmission of HIV-1 in sub-Saharan Africa”. No limitations to the study were suggested. The authors’ discussion highlighted the fact that the results were sensitive to the assumption that there were "no external benefits of VCT in reducing adult-to-adult HIV transmission". This discussion did not seem relevant to a study whose focus was on the costs and effects of drug treatments in reducing vertical transmission rates.

**Implications of the study**
The authors stated that, if the efficacy of HIVNET was "confirmed in future trials", there would be a stronger basis for wide implementation of such treatments. There were no specific suggestions for further research.

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**Other publications of related interest**


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