Antiretroviral drugs as a public health intervention for pregnant HIV-infected women in rural South Africa: an issue of cost-effectiveness and capacity

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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
Three strategies for providing antiretroviral drugs to pregnant HIV-infected women to prevent vertical transmission of HIV in rural areas in resource-poor settings. Strategy A involved delivering zidovudine (ZDV) within the current infrastructure. Strategy B required delivery of ZDV through enhanced service capacity and infrastructure consisting of widespread community health promotion, to encourage the use of available antenatal care, on-site HIV testing, extending counselling capacity, guaranteed drug supply, equipping the clinics with extra staff to assure a 24 hour maternity service, and selective avoidance of breastfeeding. Strategy C involved delivering short-course ZDV plus lamivudine through the same enhanced service capacity and infrastructure as provided in strategy B.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Pregnant HIV-infected women living in rural areas in resource-poor settings.

Setting
District hospital and community clinics. The economic study was carried out in South Africa.

Dates to which data relate
Clinical probabilities were based on published studies or unpublished data from the period 1992 to 1997. Resource use data were estimated based on consultation with the experts and on authors' assumptions. No dates were reported for resource use data. The price year was 1997.

Source of effectiveness data
Effectiveness data were derived from a review of the literature (published and unpublished data) and assumptions made by the authors.

Outcomes assessed in the review
The following outcomes were assessed: HIV prevalence in women attending antenatal clinics, HIV prevalence among children admitted to the paediatric medical service, percentage of pregnant women receiving antenatal care, percentage of pregnant women receiving antenatal care who have their first visit later than 34 weeks and therefore are not eligible for ZDV, percentage of women tested for HIV receiving test results, percentage of women adherent to antiretrovirals, percentage of women delivering in clinic or hospital to receive intrapartum antiretrovirals, percentage of women
breastfeeding and percentage who do so for 12-24 months, vertical transmission rate (VTR), effectiveness of ZDV regimen in reducing transmission, the impact of the introduction of on-site HIV testing on the increase in proportion of patients post-test counselled; the introduction of on-site syphilis testing on the increase in proportion of patients fully treated.

**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**
A total of 6 studies were included in the review.

**Methods of combining primary studies**
Each study had a separate input to the model.

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

**Results of the review**
The results were as follows:

- HIV prevalence in women attending antenatal clinics, 26%;
- HIV prevalence among children admitted to the paediatric medical service, 25.6%;
- percentage of pregnant women receiving antenatal care, 95%;
- percentage of pregnant women receiving antenatal care who have their first visit later than 34 weeks and therefore are not eligible for ZDV, 10%;
- percentage of women tested for HIV receiving test results, 17%;
- percentage of women with syphilis who do not complete treatment, 49%;
- percentage of women delivering in clinic or hospital to receive intrapartum antiretrovirals, 83%;
- percentage of women breastfeeding, 86%, and percentage who do so for 12-24 months, 60%;
- vertical transmission rate (VTR), 30%;
effectiveness of ZDV regimen in reducing transmission, 67.4%;
proportion of patients post-test counselled as a result of the introduction of on-site HIV testing, 96%;
proportion of patients fully treated as a result of the introduction of on-site syphilis testing, 75%.

**Methods used to derive estimates of effectiveness**
Effectiveness assumptions were also made by the authors.

**Estimates of effectiveness and key assumptions**
Assumed values for some parameters were as follows:

- percentage of patients receiving test results and ZDV therapy, 35%;
- effectiveness of ZDV therapy in reducing VTR in strategy A, B, and C, 50%, 58%, and 60%, respectively;
- the percentage of pregnant women attending for antenatal care as a result of successful health promotion, 97.5%;
- percentage of women attending for antenatal care later than 34 weeks and therefore ineligible for ZDV therapy after successful health promotion, 2.5%;
- percentage of pregnant women receiving the test results and the intervention as a result of on-site HIV testing and enhanced counselling capacity (strategy B), 75%; and:
- percentage of pregnant women accepting and completing treatment as a result of strategy C, 80%.

**Measure of benefits used in the economic analysis**
The benefit measures were the number of HIV infections averted and potential life-years gained for an annual cohort of 8,421 pregnant women in the study district. 2,189 (26%) of these women had HIV infection, using a life expectancy of 63 years.

**Direct costs**
Costs were not discounted because of the short time frame of the study. Quantities were reported separately from the costs. Cost items were reported separately. Cost analysis covered the costs of drugs, HIV test, health promotion, increased counselling capacity, staff, training, paediatric follow-up, and extra laboratory technician. The perspective adopted in the cost analysis was that of the health system. Resource use data were estimated based on consultation with the experts and on the authors' assumptions. Cost data were based on recent market prices or current figures in the study institution or district. The date of the price data was 1997. The cost analysis did not cover the costs of care for HIV-infected children (due to lack of accurate data from Africa) nor the costs of selective avoidance of breast feeding (because of uncertainties surrounding it).

**Indirect Costs**
Not considered.

**Currency**
US dollars ($). Exchange rate at November 1997 was $1 = 4.7 South African Rand.

**Sensitivity analysis**
One-way sensitivity analyses were performed on the discount rate for potential life-years gained and substantial
reduction in drug costs.

**Estimated benefits used in the economic analysis**
Strategy A resulted in 99 cases of HIV-infections being averted (a 15% reduction compared to the no intervention strategy).

Strategy B resulted in 272 cases of HIV-infections being averted (a 42% reduction compared to the no intervention strategy and a 27% reduction compared to strategy A).

Strategy C resulted in 307 cases of HIV-infections being averted (a 47% reduction compared to the no intervention strategy and a 5% reduction compared to strategy B).

The number of potential life-years gained was not reported. The discount rate applied for life-years gained in the base case was 3%. Results were also reported using a 6% discount rate.

**Cost results**
The strategy A was associated with a total additional cost of $574,825 versus $1,520,770 for Strategy B and $764,901 strategy C.

**Synthesis of costs and benefits**
The cost per paediatric HIV-infection and per potential life-year gained were calculated as the measures of cost-effectiveness relative to the no intervention strategy. This gave values of $5,806 (strategy A), $5,591 (strategy B), and $2,492 (strategy C) in terms of the first measure and $205 (A), $198 (B), and $88 (C) for the second measure. The incremental cost-effectiveness ratio in terms of cost per paediatric HIV-infection for strategies B and C compared to strategy A was $5,468 and $914, respectively. The corresponding values in terms of incremental cost per potential life-year gained were $193 and $32, respectively. The sensitivity analysis demonstrated that the substantial reduction of the drug costs to 10% of the current costs would dramatically reduce the cost-effectiveness ratios.

**Authors’ conclusions**
Although antiretrovirals may be relatively cost-effective in this setting, the budget required is currently unaffordable. Developing the capacity required to deliver the intervention would pose both a major challenge, and an opportunity, to improve health services.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of the comparator is clear as it represents the current practice in the authors' setting.

**Validity of estimate of measure of benefit**
It is difficult to assess the internal validity of the estimates of the benefit measure as insufficient details were provided in the paper on how the primary studies were identified and assessed and how the literature review was conducted.

**Validity of estimate of costs**
Quantities were reported separately from the costs and adequate details of the methods of cost estimation were given. Cost results may not be generalisable to other settings or countries. The omission of some important components from the cost analysis may have had adverse effects on the internal validity of the cost calculations.

**Other issues**
In view of the apparent lack of a systematic literature review and the absence of extensive sensitivity analyses, the study
results should be treated with some caution. It was pointed out that it is a limitation of the study that the effectiveness values are representative of the best-case scenario, which might not be achievable in normal conditions. Appropriate comparisons were made with other studies.

**Implications of the study**

The implications noted by the authors were as follows:

1. Longitudinal studies, including the disability-adjusted life-year (DALY) as a measure of effectiveness, with detailed costing, are required to clarify the true net long-term benefit of providing antiretroviral therapy in pregnancy;

2. The impact of selective avoidance of breast feeding is important and requires further research;

3. The possible roles of vitamin A and caesarean section (in a broader effort to improve maternity services in high HIV prevalence setting) require further study;

4. Careful operational research is required before large-scale implementation (of these kinds of interventions) is contemplated.

**Source of funding**

None stated.

**Bibliographic details**


**PubMedID**

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**Other publications of related interest**


**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

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