

Care of HIV-infected adults at Baragwanath Hospital, Soweto

Part I. Clinical management and costs of outpatient care

Anthony W. A. Kinghorn, Tennyson C. M. Lee, Alan S. Karstaedt, Brenda Khuonane, Helen Schneider

Objective. To provide a detailed breakdown of clinical presentations and management of outpatients with HIV, and associated costs, in order to inform clinical practice, health service planning and projections of the costs of HIV care in South Africa.

Setting. The outpatient department of a public sector, academic hospital in Soweto, South Africa.

Design. A retrospective, descriptive study using a record review and a combination of direct and step-down costing of health service costs (1992 prices).

Patients. All 179 patients with HIV seen at the outpatient department between 1989 and 1992.

Results. The average age at presentation was 30 years for men and 29 years for women. The most common clinical presentations at first visit were lymphadenopathy, weight loss, peripheral neuropathy and tuberculosis. Many patients, however, were asymptomatic. Analysis of clinical presentations, investigations and drugs used indicated that at least 80% of patients could have been managed at primary care level. The average cost per consultation was R112.03. Costs per patient and per visit increased with stage of disease. Most of the costs arose from variable costs, which are influenced by clinical management decisions. Laboratory investigations (30%), staff (21%) and drugs (22%), especially for fungal, viral and tuberculosis infection, were the major contributors to costs.

Conclusions. Given projected HIV infection rates and the associated, potentially enormous costs of care revealed by this study, clinicians and health service planners must identify and implement cost-effective approaches to

investigating, treating and meeting other health care needs of HIV-infected people. Treatment of people with HIV at primary care outpatient services seems both possible and potentially more cost-effective than hospital-level care in South Africa. Emphasis should be placed on building primary level capacity to take on this role effectively. Further studies are required to identify the cost-effectiveness, not only of treating HIV-related conditions, but also of treating other diseases if just and adequately informed decisions about rationing of care are required in view of resource constraints.

S Afr Med J 1996; **86**: 1484-1489.

Care of people with HIV/AIDS is imposing an increasingly large burden on health service resources in South Africa. One estimate suggests that there will be between 3.7 and 4.1 million HIV-infected people and 200 000 adults with AIDS by the year 2000. Associated health care costs of people with AIDS were projected to comprise 19 - 49% of total health care expenditure in the year 2000 and 34 - 75% in 2005, equivalent to 5.1 - 9% of GNP in the latter year.¹ HIV-related illness may already consume one-third of the health care budget in developing countries with high rates of HIV infection² and may 'crowd out' non-HIV patients.³

If South Africa is to provide adequate, affordable care for HIV/AIDS patients, accurate information on the profile of HIV-related illness, care strategies and costs of HIV/AIDS care is imperative. Information on the cost of care can also increase cost-consciousness among care providers, and thus the cost-effectiveness of clinical management decisions.

Assessment of the probable need for health care and associated costs of HIV/AIDS care to South African health services is complicated by scarcity of data on clinical presentations and costs of HIV/AIDS patient care in South Africa and even Africa,⁴⁻⁸ and difficulties of extrapolating from study- or country-specific data to local settings.⁹⁻¹³ Furthermore, most studies have focused on AIDS care¹⁴ and inpatient costs. However, earlier-stage disease and outpatient care may contribute significantly to total costs, and outpatient care may be a cost-effective substitute for inpatient care, particularly when preventive interventions become available.^{8,14-19}

Summary estimates of the costs of care produced in studies can also be misleading guides for decision-making as they often ignore variations in cost between subgroups of HIV/AIDS patients due to factors such as different clinical presentations, management and outcomes between groups and over time.^{9,20-22} Building up a range of cost estimates for different groups, with detailed explanations of cost variations, may thus be more useful than producing single average figures for costs of HIV infection.¹³

The objectives of the study were to describe the clinical presentations, management and direct costs to the health service of an HIV outpatient visit at different stages of disease. These basic data can then inform projections of potential costs of care for people with HIV/AIDS in South Africa.

Centre for Health Policy, Department of Community Health, University of the Witwatersrand, and Department of Medicine, Baragwanath Hospital, Johannesburg

Anthony W. A. Kinghorn, M.B. B.Ch., B.Sc., B.A.

Tennyson C. M. Lee, F.F.C.H. (S.A.), B.A., B.Sc., M.B. Ch.B., D.Ph.C. (ED.), D.H.S.M.

Alan S. Karstaedt, M.B. B.Ch., M.Med. (Int. Med.), D.T.M.&H.

Brenda Khuonane, B.A.

Centre for Health Policy and National AIDS Programme, Medical Research Council, Johannesburg

Helen Schneider, M.B. Ch.B., M.Med. (Comm. Health), D.C.H., D.T.M.&H.

Methods

Baragwanath Hospital is a public-sector, academic, tertiary referral hospital with experience in managing HIV/AIDS since 1987. By early 1991 the HIV outpatient department (HIV OPD) was seeing 45 - 60 adult patients per month. At the time of the study, the clinic was staffed by five senior registered nurses trained in HIV counselling, a senior specialist, two specialists and a registrar.

The study sample included all 179 patients (68 men, 111 women) who presented at the HIV OPD between October 1988 and July 1991. A retrospective record review of all their OPD visits ($N = 694$) up to October 1992 was conducted to provide data on demographic profile, clinical presentations and management, and service utilisation rates. Data were analysed with EpiInfo and SAS. Clinical staging was done according to WHO guidelines.²³ Two clinicians assessed which visits could have been managed at primary care level, using a schedule of conditions, investigations and drugs which would require higher-level care. No blinding or formal testing of reliability was used.

Costs were calculated in 1992 prices, using a step-down cost-accounting approach involving a range of assumptions, the major elements of which are discussed below.

Direct costs

Direct costs were defined as those attributable to clinical management and activity within the HIV OPD itself. Indirect costs are of back-up services provided by cost centres in the hospital that are shared with other clinical departments.

Recurrent costs

Laboratory investigation costs were based on prices charged by the South African Institute of Medical Research. Radiological investigation costs were estimated by step-down costing of the radiology department. Patient drug utilisation costs were calculated from patient records and prices of drugs bought on state tender. Staff costs were estimated from 1992 average total remuneration packages and direct observation (mid-1992) of time spent by staff with a sample of 50 patients. Maintenance cost estimates were provided by Works Department officials. Consumable costs (e.g. stationery, laundry, disposable clinical items) were obtained from 1992 price lists and allocated according to staff estimates of items used per visit or investigation.

Capital costs

Costs of buildings and capital equipment were estimated according to Works Department officials' estimates of replacement value and tender prices, respectively. Buildings were depreciated over 30 years and equipment over 5 - 10 years, at an 8% discount rate.

Indirect costs

These include administrative and support services such as stores, security, and nursing and other management costs, but exclude capital items. Costs were apportioned to HIV OPD visits according to numbers of particular activities, staff or HIV OPD visits relative to the whole hospital patient load for 1992. The indirect cost per outpatient visit was assumed to be equivalent to one-third of an inpatient day, in line with

results of recent studies (J. Broomberg — personal communication).²⁴ The sensitivity of cost estimates to this assumption was tested.

Methodological issues

Accurate costing entails considerable difficulties in the South African public sector, because many assumptions have to be made with regard to step-down costing, and the quality of available data is poor. Particular methodological issues which should be considered include the following: (i) assessment of marginal, not average, costs would better indicate costs associated with increasing patient numbers; (ii) clinical management of people with HIV may have changed — known changes are noted; (iii) prices of staff or inputs obtained by government tender may not reflect their true economic cost; and (iv) some potentially significant costs were not estimated.

These include costs of health service use outside HIV OPD before or after diagnosis of HIV, and many direct (e.g. patient transport) and indirect costs (e.g. time and foregone income of patients). Over *et al.*¹³ suggest that in Zaire and Tanzania, indirect costs of HIV infection can exceed direct costs of disease by ratios of 8:1 to 9.5:1, which are comparable with those of other diseases.

Results

Demographic data

Of the 179 subjects, 7% were 14 - 19 years old, 51% were aged 20 - 29, and 29% were aged 30 - 39 years; 13% were aged 40 years and above (14 - 29 years). Although there were more women in younger age groups, there was no significant difference between the mean ages of women (29.9 years, SD 10.03) and men (31.9 years, SD 9.06).

Of the 151 patients with known employment status, 84 (56%) were unemployed. Of the 87 patients with recorded income, 96% were in the two lowest income brackets (maximum R24 000 household income per annum). Ninety (50.3%) patients were single, 39 (21.8%) married, 11 (6.1%) divorced, and 4 (2.2%) widowed. The marital status of the remainder was unknown.

Clinical presentations

Table I lists the 10 most common clinical features at first visit and at all visits. Generalised lymphadenopathy was the commonest clinical finding. Twenty-nine per cent of visits were for routine 'check-ups' and counselling of asymptomatic people. Of the 20 people in stage 4, 15 had extrapulmonary tuberculosis, 3 had *Pneumocystis carinii* pneumonia and one each had cryptococcosis, cytomegalovirus retinitis, 'slim' disease and toxoplasmosis. Records gave no indication of deaths.

Investigations

The most frequently requested investigations are listed in Table II. The average number of investigations per visit was 2.6 (range 0 - 11). Thirty-three per cent of all investigations occurred on first visits to the HIV clinic.

Table I. Ten most common clinical conditions in HIV/AIDS outpatient care

Clinical condition	At first contact* (N = 109)†	All contacts (N = 694)
Lymphadenopathy	75 (69%)	139 (20%)
Positive HIV test but with no symptoms	37 (34%)	203 (29%)
Weight loss	32 (30%)	62 (9%)
Neuropathy	19 (18%)	37 (5%)
Tuberculosis	19 (18%)	53 (8%)
Other mucocutaneous disorders	16 (15%)	70 (10%)
Herpes zoster	9 (8%)	
Oral candida	6 (6%)	73 (10%)
Fever > 1 month	6 (6%)	21 (3%)
Oral hairy leukoplakia	4 (4%)	
Headache		19 (3%)
Pneumonia		20 (3%)

* Includes only patients whose initial contact with Baragwanath Hospital was the HIV outpatient clinic as opposed to inpatient wards.
† Patients could have more than one condition at any one time.

Table II. Use of costs of laboratory investigations for all HIV outpatient visits*

Tests	No.	(%)	Mean cost per visit (1992 rands)	% Total costs
Microbiology	73	(6.7)	2.66	7.8
Serology				
WR/FTA	129/30	(11.8/2.7)	3.48	10.3
HIV-ELISA x 2	179	(16.4)	7.42	21.9
Other	32	(2.9)	0.84	2.5
Chemistry				
U and E	128	(11.7)	5.51	16.2
Other	62	(5.7)	1.86	5.5
Haematology				
CD4	177	(16.2)	7.05	20.8
Full blood count	153	(14.0)	2.72	8.0
Other	116	(10.6)	2.15	6.3
Miscellaneous	12	(1.1)	0.22	0.7
Total	1 091	(99.8)	33.91†	100

* Costs exclude unnecessary tests, which increased total laboratory investigation costs by 178%.
† Total cost — R23 532.

Drugs

Drug courses most commonly prescribed are shown in Table III. Analgesics (14.5%) and nutritional supplements (13.2%) represented a large proportion of 'other' drugs. The average number of drug courses prescribed per visit was 1.7 (range 0 - 8). A simple drug list consistent with WHO guidelines²⁵ was used and was sufficient for dealing with most

conditions. No zidovudine (AZT) or primary prophylaxis for tuberculosis or *Pneumocystis carinii* was prescribed.

Table III. Drug use and costs for HIV outpatients

Drugs	No. (%) of courses	Average cost/visit (1992 rands)	% Total drug costs
TB treatment	182 (15.5)	4.92	19.8
Antifungal*	111 (9.5)	7.82	31.5
Antiviral†	7 (0.6)	6.4	25.8
Dermatological	139 (11.9)	1.91	7.7
Antibiotics	164 (14.0)	1.44	5.8
Other	569 (48.5)	2.33	9.4
Total	1 172 (100†)	24.82	100

* Ketoconazole and amphotericin B contributed 15% and 11.4% of drug costs respectively.

† Total cost — R17 226.

Level of care required

From the range of presentations, drugs and investigations used, it was estimated that up to 80% of contacts could have been managed at primary care level. All the stage 1 and 2 contacts (except people with complicated herpes zoster requiring acyclovir), 77% of the 266 stage 3 contacts and 49% of the 123 stage 4 contacts could have been managed at primary care level. Eighteen HIV-related consultations with specialists other than HIV OPD staff were noted, most commonly for dermatological conditions.

Ninety-seven per cent of drugs used are available at Soweto primary care facilities. All laboratory investigations could have been done at district hospital level or sent from such a facility to a more sophisticated laboratory.

Health service utilisation

Of the 179 patients, 67 (37%) made only one visit to the service. These patients did not differ from those followed up beyond one visit in terms of stage, employment, age, sex or residence in Soweto. One-third (N = 57; total visits = 435) were seen at least twice at an interval of 6 months or more, suggesting that Baragwanath was their principal source of care. In this cohort, the mean number of visits per person-year of follow-up in particular stages ranged from 3.8 in stage 1 to 6.29 in stage 4 patients. Table IV shows a high estimate of utilisation, based on this cohort. Some of the other 122 attenders may not have been true drop-outs, but may simply have remained well during the period of follow-up. Table IV therefore also reflects a low estimate of utilisation by stage for all 179 patients, calculated from the actual frequency of utilisation per person-year after initial presentation.

Table IV. Projected utilisation rates and annual HIV outpatient treatment costs

Stage	High estimate				Low estimate			
	1	2	3	4	1	2	3	4
Patient No.	17	6	27	7	69	38	52	20
Mean No. of visits/yr	3.80	7.37	6.38	6.29	1.34	1.94	2.97	3.6
Mean follow-up (mo.)	16.8	12.6	15.6	20.4	22.4	20.9	21.7	21.5
Cost: first year (R)*	323	623	708	853	189	246	377	514
Cost: subsequent years (R)	207	513	613	791	73	135	285	453

* Includes one first visit cost.

Total costs per outpatient visit

The average cost per outpatient visit was R173.23, or R112.72 if unnecessary tests were excluded (see below). Table IV shows the breakdown between cost categories. The high costs of laboratory investigations, drugs and clinic staff are of particular note.

Table V. Average cost per HIV outpatient visit (N = 694)

Cost item	Cost (1992 rands)	% Total cost*
Capital costs (buildings and equipment)	4.24	3.78
Recurrent costs		
A. Direct		
Laboratory	33.90	30.26
Radiology	5.94	5.3
Drugs	24.82	22.15
Clinic personnel		
Doctors	12.61	11.26
Nurses	6.86	6.12
Counsellor	1.34	1.2
Cleaner	2.70	2.41
Staff total	23.51	20.99
Consumables + building maintenance	1.62	1.45
B. Indirect overheads		
Staff	14.88	13.28
Non-staff	3.12	2.79
Total	112.03	100.00

* The costs of unnecessary tests were excluded.

Building/equipment capital costs and maintenance contributed relatively small amounts to the cost of the average visit. If an outpatient visit were assumed to incur 70%, rather than 30%, of an inpatient-day cost, overhead costs increased by R9.18 to 19.9% of total costs (excluding unnecessary tests).

Investigations and costs of unnecessary tests

Table II indicates the major contributors to laboratory investigation costs, which constitute the most expensive item in HIV OPD care. The actual average cost of investigations per patient visit was R94.41, if the costs of initial HIV ELISAs (combined cost = R42.40) were included in first visit costs. However, certain tests, such as *Toxoplasma*, hepatitis B and cytomegalovirus serology, β_2 -microglobulin and HIV Western blot, which were done almost routinely initially, are now done very selectively because of their limited clinical usefulness. When these unnecessary tests are excluded, the average laboratory investigation cost declined to R33.90 per visit (31% of total costs). Radiological investigations contributed R5.94 (5.4%) to the cost of an average visit. (Note that figures in subsequent sections exclude unnecessary investigations.)

Drug costs

The major contributors to drug costs are given in Table III. The 97% of the total number of courses prescribed for drugs available at primary level facilities, accounted for only

39.8% of costs, mainly because high-cost antivirals are only available at referral facilities.

Staff costs

Patients spent an average of 23.6 minutes with doctors (N = 42) and 23 minutes with nurses (N = 27), at average costs of R12.61 and R6.86 respectively. New patients spent an average of 22.5 minutes with counsellors (N = 8).

Cost differences by stage

Average costs of outpatient visits differentiated according to stage of disease are given in Table VI. Follow-up visit costs were markedly higher for later-stage patients, with an increase from R55.05 (stage 1) to R126.60 (stage 4), attributable almost entirely to drug costs.

Table VI. Costs of first and subsequent HIV outpatient visits (1992 rands)

	Stage 1	Stage 2	Stage 3	Stage 4
Cost per new patient visit				
N	69	38	52	20
Laboratory	94.61	105.40	111.90	93.24
Radiology	17.78	12.68	5.90	5.57
Drugs	4.31	7.81	16.83	32.37
Clinic personnel	30.45	30.45	30.45	30.45
Other	23.37	23.91	25.72	25.95
Total per stage	170.52	180.25	190.80	187.58
Cost per subsequent visit				
N	104	90	217	104
Laboratory	5.17	15.45	10.45	10.76
Radiology	1.09	3.09	3.55	7.77
Drugs	4.21	5.89	35.88	61.04
Clinic personnel	21.30	21.30	21.30	21.30
Other (e.g. consumables)	22.75	23.83	24.88	24.86
Total per stage	54.52	69.56	96.06	125.73

Projected annual cost

Table VI reflects high and low estimates of projected annual costs, calculated from high and low projections of service utilisation rates (see above) and cost of visits at different stages of disease. Costs for the first year include the cost of first visits. These were markedly higher than for follow-up visits, mainly because of higher investigation costs, but also because of greater staff contact time. Only average drug costs increased for follow-up visits. Costs increase notably for patients at later stages of disease, given the higher cost per visit and increased frequency of visits.

Discussion

The clinical presentations of people with HIV/AIDS found in this study are similar to those found at New Somerset Hospital, Cape Town, where mucocutaneous disorders, asymptomatic follow-up, oral candidiasis, pulmonary tuberculosis and lymphadenopathy were also among the 10 most frequent presentations.²⁶ The number of psychiatric diagnoses is low compared with that reported elsewhere.

One study found that psychiatric care accounted for 17% of HIV outpatient services utilisation.¹⁴ Another American study reported that depression was present in 26 - 42% of patients at advanced stages of disease.²⁷ Mental disorders may therefore be underdiagnosed, as occurs among general outpatients in Soweto.²⁸

The study also supports suggestions that a large proportion of outpatient care for HIV can be managed by primary care services,^{29,30} with access to essential drugs and certain investigations. Overuse of specialist level services for HIV/AIDS care, which is unsustainable in terms of service capacity and cost, has been noted elsewhere.³¹

Particularly important clinical skills are the management of candida and other mucocutaneous conditions, tuberculosis, pneumonia and diarrhoea. Treatment protocols,³² which include criteria for referral, need to be developed for the management of HIV-related conditions. The large number of people with both HIV and tuberculosis reinforces WHO recommendations for integrating tuberculosis services into the existing primary curative care services,³³ particularly to improve case detection and case-holding in areas like Soweto, where these have been found to be inadequate.³⁴

The principal findings of this study are the high cost of an average visit to the HIV OPD, and the large contribution of investigations, drugs and staff to these costs.

The relatively small contribution of fixed costs, such as capital and indirect costs, suggests limits to the potential for economies of scale to reduce certain costs per patient as more people use the service. Most significant increases in cost-effectiveness are therefore likely to come from adaptation of clinical management of people with HIV. Some decline in marginal costs may occur through shortened consultation times as patient numbers and clinicians' experience increase. However, beyond a certain point, decreased interaction time may lead to declining cost-effectiveness.

Cost advantages of care outside of tertiary academic settings would seem to be large, although comparisons are hampered by lack of data on quality of care. One study estimated the cost of HIV outpatient care in a rural KwaZulu hospital to be R13.14 per contact (at 1992 prices), excluding capital costs.⁶ Another estimated the average cost per patient consultation at a Soweto primary health care centre to lie between R37.91 (doctor) and R31.78 (nurse).³⁵ (Prices were inflated by the consumer price index for comparability with 1992 prices.) Costs *excluding* clinical staff, medicines and investigations totalled R11.99 per visit compared with R21.16 at the HIV OPD, suggesting potential for improved cost-effectiveness through care in these settings, even if clinical management remained the same.

Use and costs of investigations may be greater at a tertiary academic service than at other levels of care. However, the extremely high cost of *laboratory* investigations indicates the importance of: (i) developing protocols to guide cost-effective investigation of HIV patients. Restricting use of cost-ineffective tests in the HIV OPD effected considerable savings without appreciably reducing quality of care in the opinion of attending doctors. As 37% of patients, mainly stage 1, did not return for follow-up, the cost-effectiveness of expensive baseline tests on patients unlikely to return for follow-up should be assessed; (ii) evaluating appropriateness of investigations commonly done in

developed countries, particularly CD4 counts, prior to their use in developing countries; (iii) developing cheaper diagnostic tests for HIV; and (iv) avoiding unnecessary duplication of tests.

In addition, as health workers gain experience in HIV management, they may be able to rely more on clinical skills rather than investigations.

Radiology costs, while small compared with other items, may be under-represented, as many outpatients had previously had chest radiographs taken while inpatients. Even in primary care, chest radiographs are likely to be indispensable to the monitoring for pulmonary infections.

Although the proportion of total cost accounted for by staff is small relative to many other health care settings, the absolute costs are relatively high. Staff costs, and potential savings through cost-effective staff use, may be more significant in primary health care settings where other costs are lower. Based on average remuneration scales, our figures suggest that if primary health care nurses, rather than doctors, had performed 80% of patient consultations, clinician costs could have been reduced by 35%. This would have reduced average overall costs by 4%. Nevertheless, doctors and specialists may be cost-effective care-givers for many types of patient.

Counselling costs may be underestimated. Although no follow-up counselling was observed in this study, more recent HIV OPD experience indicates that patients have required and received it.

The high costs of treating tuberculosis, viral and fungal infections are noteworthy, as are the related findings that drug costs increase for later-stage HIV disease, and are the only costs which do not decline at follow-up visits. Reliance on less expensive antibiotics seems to have contained their contribution to costs. The large contribution of drugs to HIV costs, which would have been substantially higher in the private sector, calls for development of cost-effective treatment protocols. Drugs likely to require careful cost-effectiveness evaluation include: (i) antiretroviral agents such as zidovudine and newer multidrug regimens. We estimate that, at the 1992 price of R482.79 for 100 x 100 mg, a daily 500 mg dose of zidovudine would have added R8 810 to the annual cost of treating each patient who received it; (ii) antiviral agents for herpes infections, which are reported to contribute high percentages of drug costs in other settings;²¹ (iii) antifungal agents; and (iv) tuberculosis prophylaxis^{2,36} and expensive drugs for treating multidrug-resistant tuberculosis.³⁷

The limitations of the study's projections of annual costs of HIV outpatient care should be recognised. There are difficulties in generalising from the study site and the samples are small. The high estimate cohort, in particular, may represent sicker-than-average patients within each stage. For early-stage patients, utilisation and costs are likely to have been inflated by complaints unrelated to HIV which led to initial, early HIV diagnosis. Both estimates are inflated by the lack of alternative, potentially cheaper services, but would be underestimated in so far as some patients, particularly the 45% from outside Soweto, may have used other services, or died without the OPD's knowledge. Nevertheless, the projections reinforce the indication given by average visit costs of the potentially huge costs of the epidemic.

The high cost of HIV OPD visits and, particularly, the costs directly influenced by clinical decisions indicate the need for clinicians to adopt cost-effective approaches to management for care to be affordable and to maximise benefits for people with and without HIV. From a planning perspective, this study indicates an urgent need to identify the most cost-effective settings for care of people with HIV, and support and build the capacity of those services. Programmes should be initiated to provide clinicians with ongoing training, information and management protocols³⁸ to ensure adequate capacity and expertise to provide quality care in less expensive settings and to ensure appropriateness of referrals.

The cost of providing outpatient care to all people with HIV/AIDS is potentially massive. Ensuring that the needs of HIV and other patients are met within resource constraints requires that practitioners identify and use cost-effective clinical management approaches. Considerably more research into the *cost-effectiveness* of different uses for health care resources is required, as cost data alone have limited value in decision-making. In addition to evaluating treatment for people with HIV/AIDS, the research will need to assess various types of preventive strategies and non-HIV-related care, if it is to provide adequate information for resource allocation decisions.

The assistance of Michelle Booyesen, Zanele Ziqubu, many Baragwanath staff, Karen Itoni, David Franklin, Max Price and Jonathan Broomberg in various aspects of data collection and analysis are acknowledged with gratitude. BP (South Africa) contributed towards the cost of this study.

20. Scitovsky AA. The economic impact of AIDS. *Health Affairs* 1988; Fall: 32-45.
21. Morton A, McCallum AK, Parkin DW, Bhopal RS. The patient profile approach to assessing the cost of AIDS and HIV infection. *J Public Health Med* 1993; **15**: 235-242.
22. Seage GR, Landers S, Lamb GA, Epstein AM. Effect of changing patterns of care and duration of survival on the cost of treating AIDS. *Am J Public Health* 1990; **80**: 835-839.
23. World Health Organisation. *Interim Proposal for a WHO Clinical Staging System for HIV Infection and Disease*. Geneva: WHO, 1991.
24. McIntyre D, Bourne D. Sensitivity of hospital budgets to changes in the relative weighting of outpatient department visits. *S Afr Med J* 1994; **83**: 61.
25. World Health Organisation. *Guidelines for the Clinical Management of HIV Infection in Adults*. Geneva: WHO, 1991.
26. Metriken AS, Zwarenstein M, Steinberg M, Van Der Vyver E. Appropriate levels of outpatient care for patients with HIV/AIDS. Cape Town: Medical Research Council, 1993 (Unpublished).
27. Hoover DR, Saah A, Bacellar H, et al. The progression of untreated HIV-1 infection prior to AIDS. *Am J Public Health* 1992; **82**: 1538-1541.
28. Thom RGM, Zwi RM, Reinach SG. The prevalence of psychiatric disorders at a primary care clinic in Soweto, Johannesburg. *S Afr Med J* 1993; **83**: 653-655.
29. Northfelt DW, Hayward RA, Shapiro MF. The acquired immunodeficiency syndrome is a primary care disease. *Ann Intern Med* 1988; **109**: 773-775.
30. Sadovsky R. HIV infected patients: a primary care challenge. *Am Fam Physician* 1989; **40**: 121-128.
31. Cabral AJR. AIDS in Africa: can the hospitals cope? *Health Policy and Planning* 1993; **8**: 157-160.
32. Katabira ET, Wabitsch KR. Management issues for patients with HIV infection in Africa. *AIDS* 1991; **5**: suppl 1, S149-S155.
33. World Health Organisation. *The HIV/AIDS and Tuberculosis Epidemics. Implications for TB Control*. Geneva: WHO, 1994.
34. Saunders LD, Irwig LM, Wilson TD, Kahn A, Groenewald H. Tuberculosis management in Soweto. *S Afr Med J* 1984; **66**: 330-333.
35. Broomberg J, Rees H. *The Costs of Primary Health Care at Diepkloof Community Health Centre* (Technical Report). Johannesburg: Centre for Health Policy, 1992.
36. Masobe P, Lee T, Price M. Isoniazid prophylactic therapy for tuberculosis in HIV seropositive patients — a least-cost analysis. *S Afr Med J* 1995; **85**: 75-81.
37. Fleming AF. Multidrug-resistant tuberculosis. *Current AIDS Literature* 1993; **6**: 347-349.
38. Foster SD. Affordable clinical care for HIV-related illness in developing countries. *Bureau of Hygiene and Tropical Diseases* 1990; **87**: 1-9.

Accepted 18 Sep 1996.

REFERENCES

1. Doyle P, Broomberg J, Steinberg M, Masobe P, Behr G. AIDS in South Africa: the demographic and economic implications (Paper 23). Johannesburg: Centre for Health Policy, 1991.
2. Foster SD. Care and treatment of HIV disease in developing countries from a socioeconomic perspective. *AIDS* 1994; **8**: suppl 1, S341-S347.
3. Hassig SE, Perriens J, Baende E, et al. An analysis of the economic impact of HIV infection among patients at Mama Yemo Hospital, Kinshasa, Zaire. *AIDS* 1990; **4**: 883-887.
4. Hussey G, Robertson A, Beatty D. Children with AIDS — can we afford to treat them? *S Afr Med J* 1992; **18**: 61-62.
5. Peter DL, McDougall M, Maartens G, Girdler-Brown BV. The cost of adult AIDS patient care. *S Afr Med J* 1994; **84**: 447-449.
6. Dave-Sen P, Pillay S. Efficiency. In: Soldan K, Abdool Karim Q, Abdool Karim S, eds. *Home-based Care for HIV/AIDS: An Evaluation of the KwaZulu Pilot Programme*. Durban: Medical Research Council, 1993; 55-87.
7. Taylor G. AIDS and medical care costs. *AIDS Analysis Africa* (Southern Africa Edition) 1992; **3**: 4-5.
8. Schopper D, Walley J. Care for AIDS patients in developing countries: a review. *AIDS Care* 1992; **4**: 89-102.
9. Drummond FM, Davies LM. Treating AIDS: the economic issues. *Health Policy* 1988; **10**: 1-19.
10. Scitovsky AA, Cline M, Lee PR. Medical care costs of patients with AIDS in San Francisco. *JAMA* 1986; **256**: 3103-3106.
11. Seage GR, Landers S, Barry MA, Groopman J, Lamb GA, Epstein AM. Medical care costs of AIDS in Massachusetts. *JAMA* 1986; **256**: 3107-3109.
12. Scitovsky AA, Over M. AIDS: costs of care in the developed and developing world. *AIDS* 1988; **2**: suppl 1, S71-S81.
13. Over M, Bertozzi S, Chin J, N'galy B, Nyamuryekung'e K. The direct and indirect costs of HIV infection in developing countries: the cases of Zaire and Tanzania. Fleming AT, Carballo M, Fitzsimmons DW, et al., eds. *The Global Impact of AIDS*. New York: Alan D Liss, 1988.
14. Rietmeijer CA, Davidson AJ, Foster CT, Cohn MD. Cost of care for patients with human immunodeficiency virus infection. *Arch Intern Med* 1993; **153**: 219-225.
15. Sadovsky R. HIV-infected patients: a primary care challenge. *Am Fam Physician* 1989; **40**: 121-128.
16. Northfelt DW, Hayward RA, Shapiro MF. The acquired immunodeficiency syndrome is a primary care disease. *Ann Intern Med* 1988; **109**: 773-775.
17. Beresford L. Alternative, outpatient settings for care of people with AIDS. *ORB* 1989; **15**: 9-16.
18. Kouri Y, Shepard D, Borrás F, Sotomayor J, Gellert G. Improving the cost-effectiveness of AIDS care in San Juan, Puerto Rico. *Lancet* 1991; **337**: 1397-1399.
19. De Kock KM, Lucas SB, Lucas SE, Agness J, Kadjo A, Gayle HD. Clinical research, prophylaxis, therapy and care for HIV disease in Africa. *Am J Public Health* 1993; **83**: 1385-1389.