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# Costs and cost-effectiveness of alternative tuberculosis management strategies in South Africa — implications for policy

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*Objective.* To conduct an economic analysis of the Hlabisa community-based directly observed therapy management strategy for tuberculosis and to project costs of three alternative strategies.

*Setting.* Hlabisa health district, KwaZulu-Natal, South Africa.

*Methods.* An economic analysis comparing the current tuberculosis management strategy in Hlabisa with three alternative strategies (the Hlabisa strategy prior to 1991 based on hospitalisation, the national strategy and sanatorium care) in terms of costs to both health service and patient and of cost-effectiveness.

*Results.* The current Hlabisa strategy was the most cost-effective (R3 799 per patient cured), compared with R98 307 for the strategy used prior to 1991, R9 940 for the national strategy, and R11 145 for sanatorium care. Between 71% and 88% of treatment costs lie with the health service, and hospitalisation (R119 per day) is the most expensive item. Prolonged hospitalisation is extremely expensive, but community care is cheaper (community clinic visit, R28; community health worker visit, R7). The total cost of supervising a patient in the community under the current Hlabisa strategy was R503, equivalent to 4.2 days in hospital. Drug costs (R157) are equivalent to just 1.3 days in hospital.

*Conclusion.* Cost to both health service and patient can be substantially reduced by using community-based directly observed therapy for tuberculosis, a strategy that is cheap and cost-effective in Hlabisa. These findings have important national implications, supporting the goals of the new tuberculosis control programme.

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With around 100 000 cases each year, tuberculosis is the most frequently notified disease in South Africa.[1] Incidence, at around 300 per 100 000 population, is one of the highest rates in the world. In sub-Saharan African countries that are hardest hit by the HIV epidemic, tuberculosis incidence has increased dramatically.[2] The impact of HIV on tuberculosis in South Africa is not yet reflected in notification data. However, in Hlabisa in northern KwaZulu-Natal — the province with the highest HIV prevalence[3] — the number of patients admitted between 1991 and 1996 increased threefold. In 1995, 58% of adults with tuberculosis in Hlabisa were HIV infected.[4] With coincident high rates of tuberculosis and HIV infection, South Africa will inevitably face a much increased burden of tuberculosis in the near future. The impact that this will have on the high prevalence of multidrug resistance in some parts of the country is of serious concern.[5]

The Department of Health has adopted a tuberculosis control programme based on that advocated by the World Health Organisation and the International Union Against Tuberculosis and Lung Disease (IUATLD),[6] recommending ambulatory care. The redesign of tuberculosis control in South Africa is to be welcomed as the previous fragmented and unco-ordinated approach was unsatisfactory. Treatment completion rates — although not known in detail for most of the country — are generally considered inadequate.[7] Through a simplified approach to tuberculosis management,[8] which entails intermittent community-based directly observed therapy, the Hlabisa tuberculosis control programme achieved an 85% completion of treatment rate between 1991 and 1994.[9] Associated rates of drug resistance are low[10] and the cure rate among those completing treatment is 95%.[11]

With increasing caseloads and constrained budgets, the relative cost-effectiveness of alternative strategies should inform policy decisions about what form tuberculosis control in South Africa will take. We conducted a detailed costing analysis of the Hlabisa tuberculosis control programme, and used these data to estimate costs of three alternative strategies.

## Methods

The study took place in the Hlabisa health district of KwaZulu-Natal in May 1996.

### *Alternative strategies*

Four different tuberculosis control strategies were compared. The current approach used in Hlabisa (strategy 1) was compared with the strategy in place in Hlabisa prior to 1991 (strategy 2) in order to gain insight into the impact of introducing community-based directly observed therapy in a district and because strategy 2 reflects what is currently in place in much of South Africa.[7] The projected cost and cost-effectiveness of the national policy (strategy 3) were also compared, as was the strategy used by the South African National Tuberculosis Association (SANTA) whereby patients are managed as inpatients in a sanatorium. The essential components of the four strategies are outlined in Table I. For simplicity, and because this group is the most important from a public health perspective, our analysis refers to the

period following diagnosis of new adult cases of tuberculosis. Costs of treating children and retreatment cases differed little (data not shown).

The current Hlabisa programme (strategy 1) and its results have been described.[8,9] In brief, all patients are admitted for a minimum of 2 weeks (average length of stay is 17.5 days), during which time they receive four drugs daily (Table I). All patients are eligible for community-based directly observed therapy, and in 1994 90% received it.[9] The same four drugs are then given in a high dose twice weekly as directly observed therapy in the community. On discharge all patients are transported to their supervisor. The supervisor is chosen by the patient on the basis of closeness to his home or workplace, and the supervisor holds all the treatment packs required to complete a 6-month course of therapy. The patient visits his supervisor twice weekly and ingests the treatment under direct observation. A fieldworker visits each supervisor monthly to collect patient outcome data and to trace absconders. Patients are supervised either by health workers (clinic nurses and community health workers) or voluntary non-health workers (mainly storekeepers): in 1994, 56% were supervised by volunteers.[9] Patients are not routinely seen during treatment. A medical officer devotes 20% of his time to management of the programme, the tuberculosis ward is staffed by various grades of nurse, and there are two fieldstaff who use a vehicle two or three times each week.

The previous approach used in Hlabisa (strategy 2) — typical of that currently used in many parts of South Africa[7] — relied on a lengthy period of hospital admission. Patients took four drugs daily for 4 months as inpatients, followed by a further 4 months of unsupervised daily outpatient therapy with two drugs (collecting treatment from a clinic monthly). Smears and chest radiographs were performed monthly during admission, and patients were invited to return for the same on completion of therapy. No active programme management was undertaken and a treatment completion rate of 18% for patients treated in 1990 was documented from a record review undertaken in 1991.

The guidelines provided by the Department of Health[12] do not dictate an exact programme structure at district level. Rather, they provide guidance on various aspects of implementation of the new control programme. In parts, the guidelines set out what should be done (e.g. smear examination at certain times, drug regimens to be used), in other parts they are less clear (e.g. length of hospitalisation, supervision arrangements). To compare the national strategy with the two Hlabisa strategies we assumed a 'best-case' scenario for effectiveness of the national strategy at 91% cure rate, as this has been achieved in some IUATLD model programmes from which this strategy is drawn.[13] In other model programmes cure rates are considerably lower.[14] The national goal is cure of 85% of all smear-positive cases.[12] As the IUATLD programmes rely on an initial 2-month hospital stay as a way of improving compliance, and as this is done in many parts of South Africa,[7] we costed strategy 3 accordingly. We recognise that different provinces use differing periods of admission and the effect of this can be

**Table I. Summary of components of alternative tuberculosis management strategies**

| Strategy | Drug regimen* | Sputum examination | X-rays | Drug sensitivity testing | Hospital stay | Number of visits to collect pills or to take therapy under direct observation | Supervision | Programme management |
|---|---|---|---|---|---|---|---|---|
| Hlabisa (1991-current) | 6HRZE for adults | No routine examination after diagnosis | None routinely after diagnosis | Not done | Minimum 2 weeks (average 17.5 days) | Twice a week to a named supervisor for DOT to complete treatment | Two fieldworkers to organise supervision. Average 14 community trips per month with vehicle and driver to deliver patients and to supervise supervisors | 20% of 1 medical officer's time |
| Hlabisa (until 1991) | 4HRZE + 4HE | Monthly during therapy and at end of treatment | Monthly during therapy and at end of therapy | Not done | Initial 4 months of therapy | Once a month to a clinic to collect a 1-month supply during the second 4 months of therapy | Not part of the management strategy | Not part of the management strategy |
| Department of Health | 2HRZE + 4HR | Examined at 2 months, at 3 months if one sputum still positive at 2 months, at 5 months and at 6 months | None routinely after diagnosis | Not routine | Not specified | Five times a week in the intensive phase of therapy for all non-hospitalised patients; 3 - 5 times a week in the continuation phase of treatment | Not specified | Programme audit and record-keeping seen as essential |
| SANTA | Follows national guidelines | Follows national guidelines | Varies according to clinician | Not routine | Until cure | N/A | N/A | Inpatient stay |

* Numbers refer to duration of therapy in months.
H = isoniazid; R = rifampicin; Z = pyrazinamide; E = ethambutol; DOT = directly observed therapy.

extrapolated from the data presented. Ambulatory care is recommended for new patients but it is not clear how, or if, this will be achieved nationally.

Many patients are still treated in sanatoria in South Africa. SANTA, which plays a major role advocating a positive societal response to tuberculosis, until recently depended in large part on full inpatient stay to treat patients. This study was not designed to assess in detail the cost of sanatoria-based care, but rather to provide a reasonable means of comparison with the other strategies. The structure of care in terms of frequency of smear examinations and drug regimen was assumed to be similar to the national strategy.

### Effectiveness measure

The ideal measure of effectiveness is the bacteriological cure rate. The cure rate for strategy 1 is 81% (95% of the 85% that complete treatment);[9,11] for strategy 2 it is estimated at 17% (95% of the 18% that completed treatment), and for strategy 3 it is 91%.[13] We assumed a cure rate of 95% for strategy 4.

### Costing analysis

Costs incurred by the health service and the patient were determined in detail for strategy 1. These are reported in detail elsewhere[15] and are summarised here. We then used these data to estimate the costs of strategies 2 and 3 were they to be implemented in Hlabisa now. The actual components of each strategy are similar — hospital stay, sputum examination, X-ray examination, outpatient or supervisor visits, supervision of supervisors, drugs and programme management. What varies is whether each component is included in the strategy, the details of each component (e.g. type of drug regimen) and its relative importance (e.g. length of hospital stay). For strategy 4, economies of scale operate and costings estimated by SANTA were used (M Stafford, SANTA — personal communication). These were estimated to be R40 per patient per day. It was assumed that patient costs were independent of the management strategy used.

Health system cost data were obtained from a variety of sources including district budget files and payroll, vehicle logbooks, laboratory and radiography department records, interviews with the architect, hospital administrator and medical superintendent, and various medical supply companies. Recurrent and capital health system costs used gross salary and expenditure rather than budgeted figures as appropriate and capital costs were annualised using a discount rate of 8%. To estimate patient costs, a structured questionnaire was administered to all 48 patients in the Hlabisa tuberculosis ward awaiting discharge to community-based directly observed therapy at the time of the study. We enquired about time and travel costs associated with clinic visits, number of dependants, employment and other income-generating activities, impact of admission on self and others, and amount of lost income.

Only costs of treating new adult patients after diagnosis are reported here. Comparisons between strategies can therefore be made and the cost of treating other categories of patient (e.g. retreatment cases that require longer hospitalisation and different drug regimens) can be estimated from the data presented. We did not consider the positive cost implications of improved control and subsequent reduced transmission because these are largely speculative.

The analysis focuses on average costs (total cost expended divided by the total number of patients treated) because we consider these to be more directly relevant than marginal costs. An average cost gives a better indication of the overall cost of a programme and thus allows a more rigorous comparison; marginal costs are more influenced by underutilisation within a system and do not account for costs that are incurred for all patients who use a health care system. Marginal costs (cost of managing the last patient) are lower than average costs if there is spare capacity within the system. For marginal cost calculations, staff and building costs were assumed to be zero, because if they are in place but underutilised then the opportunity cost of using them for an additional patient is zero. All other costs were assumed to be the same as those reported for average costs. Marginal costs could not be calculated for sanatorium care. In calculating cost-effectiveness, it was assumed that patients not completing treatment defaulted at hospital discharge.

## Results

At a cost of R3 799 per patient cured, the current Hlabisa strategy was the most cost-effective (Table II), followed by the national strategy (R9 940). Hospital-based care is expensive (R16 950 per patient treated in Hlabisa prior to 1991). Care in a sanatorium is also expensive ((R11 145 per patient cured) even though the cost per patient per day is lower than in a district hospital (R40 in sanatoria v. R119).

Despite very different approaches, a similar proportion (71 - 88%) of the cost of treating tuberculosis lies with the health service (Table II). The absolute cost to the patient was lowest with strategy 1 (R394); lengthy hospitalisation does not make treatment cheaper for patients. Marginal costs were also lowest for strategy 1.

**Table II. Costs and cost-effectiveness of alternative tuberculosis management strategies (rands)**

| Strategy | Health system cost (%) | Patient cost (%) | Total cost (%) | Cost per patient cured* | Marginal cost |
|---|---|---|---|---|---|
| Hlabisa (current) | 2 767 (88) | 394 (12) | 3 161 (100) | 3 799 | 866 |
| Hlabisa (pre-1991) | 14 814 (87) | 2 136 (13) | 16 950 (100) | 98 307 | 3 974 |
| Department of Health | 7 851 (87) | 1 225 (13) | 9 076 (100) | 9 940 | 2 174 |
| SANTA† | 7 473 (71) | 3 115 (29) | 10 588 (100) | 11 145 | Unknown |

* Measure of cost-effectiveness.
† Based on cost per day = R40.

The cost of each of the items that makes up the total cost to the health service is shown in Table III. The greatest cost is hospitalisation (R119 per day). Even the most expensive drug regimen (R157 for a 6-month course under strategy 3) is equivalent to just 1.3 days in hospital. It is worth highlighting the low cost of the supervision component of strategy 1: including salary and transport costs, the total cost of supervising each patient averages R503, equivalent to just 4.2 days in hospital.

**Table III. Components of health system costs in Hlabisa**

| Item | Average cost (rands) |
|---|---|
| 1 day in hospital (excluding drugs and investigations) | 119 |
| Average cost of a community clinic visit (excluding drugs and investigations) | 28 |
| Average cost of a visit by a community health worker | 7 |
| Average cost to the health system of a DOT visit* | 7 |
| Drugs (average cost per patient): Hlabisa (until 1991) | 223 |
| Drugs (average cost per patient): Hlabisa (current) | 157 |
| Drugs (average cost per patient): Department of Health guidelines | 151 |
| Average cost of supervision per patient (including vehicle and field worker costs) | 167 |
| Programme management (average cost per patient)† | 24 |
| X-ray (average cost) | 24 |
| Sputum examination (average cost) | 7 |

* Assumes pattern of DOT in Hlabisa in 1994[5]: (56% supervised by non-health workers and 44% by health workers).
† Assumes 20% of a medical officer's time is devoted to these duties.
DOT = directly observed therapy.

Table IV lists the components of the cost borne by patients. Visiting hospital for care is expensive (R42 per visit), as is time spent in hospital (R17 per day). Being supervised at a community clinic is cheap (R3), and it is cheaper still for the patient when supervision is by a non-health worker (R1). Patient costs are related to travel costs and lost income.

**Table IV. Components of costs for patients treated in Hlabisa**

| Cost item | Cost (rands) |
|---|---|
| Average cost of a visit to a village clinic | 11 |
| Average cost of a visit to hospital | 42 |
| Average cost of a village clinic DOT visit | 3 |
| Average cost of a community health worker DOT visit | 2 |
| Average cost of a non-health worker DOT visit | 1 |
| Total average cost of a DOT visit in Hlabisa* | 2 |
| Average cost of a day in hospital | 17 |

DOT = directly observed therapy.
* Assumes pattern of DOT in Hlabisa in 1994[5] (56% supervised by non-health workers and 44% by health workers).

In Table V costs of items contributing to health system costs for each of the strategies are compared. Hospitalisation accounts for most of this cost, and the proportionate cost rises with length of stay. Importantly, costs of other items vary little between strategies, and the costs of drugs are relatively minor health system costs. Similarly, for costs borne by patients (Table VI) hospitalisation accounts for most of the cost.

**Table V. Comparative health system costs of alternative strategies**

| Item | Cost in rands (% of total) | | | |
|---|---|---|---|---|
| | Strategy 1 | Strategy 2 | Strategy 3 | Strategy 4 |
| Days in hospital | 2 083 (75) | 14 280 (96) | 7 140 (92) | 7 280 (97.5) |
| Drugs | 157 (6) | 223 (2) | 151 (2) | 151 (2) |
| Microscopy/radiology | N/A | 155 (1) | 42 (0.5) | 42 (0.5) |
| Visits for DOT/collection of treatment/check-ups | 336 (12) | 156 (1) | 494 (6) | N/A |
| Supervision (1 vehicle and 2 fieldworkers) | 167 (6) | N/A | N/A | N/A |
| Programme management | 24 (1) | N/A | 24 (0.5) | N/A |
| Total | 2 767 (100) | 14 814 (100) | 7 851 (100) | 7 473 (100) |

* Assumes 20% of a medical officer's time is devoted to these duties.
DOT = directly observed therapy; NA = not applicable.
Strategy: 1. Hlabisa (current) — 17.5 days in hospital; 2. Hlabisa (pre-1991) — 120 days in hospital; 3. Department of Health — 60 days in hospital; 4. SANTA — 182 days in hospital @ R40 per day.

**Table VI. Comparative patient costs of alternative strategies**

| Item | Cost in rands (% of total) | | | |
|---|---|---|---|---|
| | Strategy 1 | Strategy 2 | Strategy 3 | Strategy 4 |
| Days in hospital | 298 (76) | 2 040 (96) | 1 020 (83) | 3 094 (99.5) |
| Visits for DOT/collection of treatment/check-up | 96 (24) | 96 (4) | 205 (17) | 21 (0.5) |
| Total | 394 (100) | 2 136 (100) | 1 225 (100) | 3 115 (100) |

DOT = directly observed therapy.
Strategy: 1. Hlabisa (current) — 17.5 days in hospital; 2. Hlabisa (pre-1991) — 120 days in hospital; 3. Department of Health — 60 days in hospital; 4. SANTA — 182 days in a sanatorium.

## Discussion

Our results show that the current approach to tuberculosis management in Hlabisa is both cheap and cost-effective. The current strategy is 28 times more cost-effective than the approach employed prior to 1991, and 2.7 times more cost-effective than the national strategy, were this to be employed in the district with an initial period of hospitalisation. Community-based care is three times more cost-effective than sanatorium-based care.

Cure rates in Hlabisa increased from 17% in 1990 to 81% between 1991 and 1994, while the cost of curing a patient fell from R98 307 to R3 799. This illustrates the positive achievements in improved effectiveness and reduced cost that can be achieved at district level with the introduction of community-based directly observed therapy. The main reason for the current low cost in Hlabisa is the short period of hospitalisation (Table V); all other components of the cost of tuberculosis management (including drugs) are relatively small when compared with the cost of hospital care. Community-based care similarly reduces absolute patient costs (Table VI). The reduced cost to both the health service and the patient through the use of non-health workers is substantial (Table IV).

It is not appropriate simply to reduce the length of hospital stay in order to cut costs, although it is known that hospitalisation *per se* is not essential to the management of tuberculosis and that community-based directly observed therapy is a highly effective alternative.[16] To be rational, a policy of reduced hospital stay must be linked to a policy of strong and effective community-based care. Our results show that community-based care is cost-effective. Compliance is high in the Hlabisa programme and it would seem that this is, at least in part, because of the low cost and high convenience to the patient of community-based directly observed therapy. A visit to a non-health worker in our study did not require any monetary expenditure; the small cost to the patient (R1) is a reflection of time lost from income-generating activity. Visits to clinics (R4) and particularly to hospital (R42) are more expensive because travel costs rise and time lost from work increases.

When the emphasis of care is shifted from hospital to community, total costs are reduced and improved cost-effectiveness is possible. The cost of supervision in Hlabisa is not high: the total cost to the health service of overall supervision for each patient (including delivery to supervisor and monthly checks of supervisor) is R503, equivalent to the cost of 4.2 days in hospital. Employing field staff and buying vehicles to run a community-based directly observed therapy programme can be an attractive economic option in this setting.

Sanatorium-based care is cheaper than hospitalisation because sanatoria do not provide the other services and staff that are found in a district hospital. The cost per patient-day is substantially lower in sanatoria than hospital. However, even relatively cheap institutional care is more expensive and hence less cost-effective than community-based care. Although more patients with tuberculosis do require lengthy hospitalisation in the HIV era, even with the high seroprevalence levels observed in our setting, 90% of patients are successfully managed as outpatients.[9]

Can our findings be applied to the rest of South Africa? A similar service was successfully provided in Pinetown 20 years ago (G M Short — personal communication), and the same approach is currently being implemented in the Nkandla health district of KwaZulu-Natal (G Dean — personal communication). Now that the system has been piloted, audited and costed, there seems to be no inherent reason why the key components of short hospital stay and a strong community-based directly observed therapy programme could not be implemented in other parts of South Africa, although actual implementation would need to be guided by local circumstances.

This approach to tuberculosis management is affordable within current budgetary constraints, is implementable within existing infrastructure, and offers hope for coping with the increased tuberculosis caseload. Our study provides important cost and cost-effectiveness data on alternative tuberculosis management strategies in South Africa, data that were not previously available. The findings show that a simplified approach to tuberculosis management based on short hospital stay and a strong community programme is cost-effective. Policy-makers may wish to consider applying aspects of these findings to their decisions about what form an effective tuberculosis control strategy in South Africa should take. Our findings support the goals of the new national tuberculosis control programme.

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**REFERENCES**

1. Department of Health. Table of Notifiable Medical Conditions. *Epidemiological Comments* 1995; **22:** 231.
2. Kochi A. The global tuberculosis situation and the new control strategy of the World Health Organisation. *Tubercle* 1991; **72:** 1-6.
3. Department of National Health and Population Development. Fourth national HIV survey in women attending antenatal clinics, South Africa, October/November 1993. *Epidemiological Comments* 1994; **21:** 68-78.
4. Davies GR, Wilkinson D, Colvin M. HIV and tuberculosis (Letter). *S Afr Med J* 1996; **86:** 91.
5. Weyer K, Groenewald P, Zwarenstein M, Lombard CJ. Tuberculosis drug resistance in the Western Cape. *S Afr Med J* 1995; **85:** 499-504.
6. World Health Organisation. *Treatment of Tuberculosis: Guidelines for National Programmes*. Geneva: WHO, 1993.
7. Weyer K, Fourie PB. *Assessment of the Tuberculosis Epidemic in South Africa — Historical Perspective and Critical Evaluation of Current Information*. Pretoria: Medical Research Council, 1996.
8. Wilkinson D. High-compliance tuberculosis treatment programme in a rural community. *Lancet* 1994; **343:** 647-648.
9. Wilkinson D, Davies GR, Connolly C. Directly observed therapy for tuberculosis in rural South Africa, 1991, through 1994. *Am J Public Health* 1996; **86:** 1094-1097.
10. Wilkinson D, Pillay M, Davies GR, Sturm AW. Resistance to antituberculosis drugs in rural South Africa: rates, patterns, risks, and transmission dynamics. *Trans R Soc Trop Med Hyg* 1996; **90:** 692-695.
11. Wilkinson D, Anderson E, Davies GR, Sturm AW, McAdam KPWJ. Efficacy of twice-weekly treatment for tuberculosis given under direct observation in Africa. *Trans R Soc Trop Med Hyg* 1997 (in press).
12. Department of Health. *The South African Tuberculosis Control Programme. Practical Guidelines 1996*. Pretoria: Department of Health, 1996.
13. Graf P. Tuberculosis control in high prevalence countries. In: Davies PDO, ed. *Clinical Tuberculosis*. 1st ed. London: Chapman & Hall, 1994: 325-339.
14. Harries AD, Nyong'Onya Mbewe L, Salaniponi FML, *et al*. Tuberculosis programme changes and treatment outcomes in patients with smear-positive pulmonary tuberculosis in Blantyre, Malawi. *Lancet* 1996; **347:** 807-809.
15. Floyd K, Wilkinson D, Gilks CF. Economic analysis of the Hlabisa tuberculosis control programme and alternative strategies. Hlabisa-Liverpool HIV Link Report, Liverpool School of Tropical Medicine, 1996.
16. Bayer R, Wilkinson D. Directly observed therapy for tuberculosis: history of an idea. *Lancet* 1995; **345:** 1545-1548.

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