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Patient costs of accessing collaborative tuberculosis and human immunodeficiency virus interventions in Ethiopia

A. Vassall,* A. Seme,† P. Compernolle,* F. Meheus*‡

***Department of Development Policy and Practice, Royal Tropical Institute, Amsterdam, The Netherlands; †Department of Community Medicine, University of Addis Ababa, Addis Ababa, Ethiopia; ‡Epidemiology and Disease Control Unit, Department of Public Health, Institute of Tropical Medicine, Antwerp, Belgium**

SUMMARY

OBJECTIVE: To measure the patient costs of tuberculosis and human immunodeficiency virus (TB-HIV) services from hospital-based pilot sites for collaborative TB-HIV interventions in Ethiopia.

METHODS: Costs of pre-treatment and treatment for a range of TB-HIV services provided as part of a collaborative TB-HIV programme in Ethiopia were estimated.

RESULTS: Patient costs were found to be substantial compared to income levels. Pre-treatment costs were 35% of annual household income for TB patients (with no HIV), 33% for those with TB and HIV and 40% for those with HIV (with no TB). Pre-treatment direct costs were particularly significant. Patient costs during treatment for TB range between 49% and 71% of annual household income. Patient costs in the first year of antiretroviral treatment were 21% of annual household income. Costs fell as treatment progressed.

CONCLUSION: Our results highlight the need to mitigate the economic impact on patients of treatment for TB and HIV/AIDS (acquired immune-deficiency syndrome) in low-income countries. Collaborative TB-HIV services may provide an opportunity to reduce pre-treatment costs by providing an additional channel for the early diagnosis of HIV. Costs may be further reduced by ensuring that diagnostics are provided free of charge, providing social support at the start of treatment and bringing services closer to the patient.

KEY WORDS: tuberculosis; HIV/AIDS; patient costs; economic impact

THE DISEASES of tuberculosis (TB) and human immunodeficiency virus (HIV) are inextricably linked. TB is the leading cause of death among people with HIV infection, and HIV can fuel the TB epidemic.[1] Countries with high HIV prevalence urgently need to develop packages of collaborative TB-HIV prevention and treatment that adequately address the dual nature of both epidemics. Ethiopia has one of the highest TB burdens in the world; the incidence of TB is estimated to be 159 smear-positive TB cases per 100 000 population. Over 1.7 million people (4.4% of the adult population) are living with HIV/AIDS (acquired immune-deficiency syndrome), and around 30% of those with TB are HIV-positive.[2,3]

Several countries in sub-Saharan Africa have piloted a district-based strategy for the collaborative provision of TB-HIV prevention and treatment services.[4,5] This approach includes the promotion of HIV counselling and testing as an entry point into a package of TB-HIV-related interventions. An important motivation is the assumption that by offering a range of services to those with HIV, the public will increase their use of HIV testing services and eventually change their risk behaviour, thus reducing HIV incidence.

Evidence on the patient costs of collaborative TB-HIV packages is essential to the development of services that are affordable in low-income settings. Several studies have examined the health service costs of providing interventions to address TB and HIV.[6–15] However, most of these do not include an assessment of patient costs. Other studies have examined patient costs and economic impact at the household level and focus either on TB and TB treatment or AIDS,[16–23] but not the costs of a combined package.

The aim of the present study was to estimate the patient costs of a comprehensive range of services included in the TB-HIV package in a low-income setting.

METHODS

Setting

In 2005, the Ethiopian Federal Ministry of Health began to respond to the dual nature of the TB-HIV epidemic. Shortly thereafter, TB-HIV collaborative services were launched in nine pilot sites.[24–26] All interventions follow the World Health Organization (WHO) TB-HIV clinical guidelines (Table 1). Purposive sampling was used to select study sites from

Correspondence to: Anna Vassall, Royal Tropical Institute, Mauriskade 63, Amsterdam 1090 HA, The Netherlands. e-mail: anna.vassall@lshtm.ac.uk

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Table 1 TB and HIV services and treatment protocols provided at the study sites

Treatment	Tests	Visits		Drugs
TB treatment for smear-positive out-patients	4 sputum smears + general laboratory investigations 2 chest X-rays	Daily out-patient visits for 8 weeks	Monthly out-patient visits for 6 months	Standard WHO regimens 2ERHZ/6EH* for Category 1 patients
TB treatment for smear-positive in-patients	4 sputum smears, plus general laboratory investigations 2 chest X-rays	In-patient for 2 months	Monthly out-patient visits for 6 months	2ERHZ/6EH* for TB Category 1 patients
INH preventive treatment	1 sputum smear 2 chest X-rays	Monthly out-patient visits for 6 months		INH 300 mg daily for 6 months
Cotrimoxazole preventive treatment	One visit to clinician for clinical assessment, plus general laboratory investigations	As part of TB visit weekly adherence session for 1 month, two-weekly sessions for the second month and one visit a month thereafter up to 8 months	Thereafter, monthly visits to a clinician for adherence counselling at general out-patients every 3 months	Cotrimoxazole, 960 mg daily
Antiretroviral treatment	1 rapid test (Determine) + general laboratory tests 2 CD4 counts 2 chest X-rays	Weekly visits for 1 month, two-weekly visits for 1 month	Thereafter, monthly visits to a clinician for adherence counselling and every 3 months	First-line treatment only: stavudine + lamivudine + nevirapine
TB patient attending VCT	1 rapid test (Determine®) 1 confirmation test (Capilous®) for 10% of patients 1 discrepancy test (Unigold®) for 5% of patients	Post-test counselling	Pre- and post-test counselling conducted in one visit	
Out-patient treatment for opportunistic infections	Diagnostic test according to type of treatment		1–4 visits according to type of treatment	Drugs according to type of treatment

*Numbers before the letters indicate the duration in months of the phase of treatment.
TB = tuberculosis; HIV = human immunodeficiency virus; WHO = World Health Organization; E = ethambutol; R = rifampicin; H, INH = isoniazid; Z = pyrazinamide; VCT = voluntary counselling and testing.

among the pilot sites. We selected hospitals according to type of geographic location (rural, urban, peri-urban), and size and type of facility (district, tertiary, bed size). Three of the nine pilot sites were selected for this study: Black Lion, Hosanna and Jimma. Hosanna hospital has 120 beds and is a zonal hospital located in Hosanna in the southern part of Ethiopia. Hosanna District is rural, with the population depending on subsistence farming for its livelihood. The Jimma Specialised Hospital has 350 beds and is located in the southwestern part of the country. Jimma District is rural, in a region where cash crops are grown. The Black Lion Specialised Teaching Hospital has 850 beds and is located in Addis Ababa, the capital of Ethiopia, in the centre of the country.

Sampling

A stratified sampling technique was used to ensure a mix of patients using different TB-HIV services at different points in their treatment. Stratification was performed, on the basis of study site, age, sex and disease, to be representative of the pattern in the total eligible population. Convenience sampling was used; patients within each quota were interviewed at the facility after receiving treatment. The total sample size was 250 patients, out of an eligible population of 2928 patients starting TB or HIV treatment in the year of the study. This sample size was established after a review of similar studies, as little is known about the characteristics of the overall population of TB patients. The study population was confined to patients using TB-HIV pilot services who were diagnosed with and receiving treatment for either TB, HIV-related illnesses or both. TB patients were identified through diagnosis by smear sputum microscopy and for HIV using a standard rapid test (Table 1).

Measuring patient costs

The conceptual framework for the measurement of patient costs draws on guidelines for cost analysis in general,[27] in addition to specific TB-costing guidelines.[28] The experience of conducting living standards measurement surveys (LSMS) in Ethiopia was also used to inform both the broad approach and instrument design. Four types of costs were measured: direct (non-transport), direct (transport), indirect and carer costs. Direct costs include the out-of-pocket (monetary) expenditures, such as payments for drugs, transport and food. Indirect costs were defined as loss of household income from production and employment. Carer costs consist of the costs incurred by care givers and families looking after the patient during treatment. Costs

were estimated for two periods: pre-treatment and during treatment. Pre-treatment was defined as the period between the onset of symptoms and the first visit to the TB-HIV services. The treatment period was defined from start to completion of treatment. In the case of antiretroviral treatment (ART) and cotrimoxazole preventive treatment (CPT), the treatment period was the first year of treatment.

All patients aged ⩾15 years who consented were eligible for the study. Patients who had completed treatment or who were critically ill were excluded from the study (for practical reasons and to minimise recall bias). A structured questionnaire was used. This was pre-tested on similar patients in the same setting. Interviews were conducted by medical professionals not directly involved in treating the patient. Medically trained interviewers were selected, as they were best able to define the date of onset of illness. Further information about each patient was gathered from medical records (registries and patient charts). Indirect costs were estimated using questions based on the LSMS. This leads interviewees through a series of questions concerning household income from different sources, including agriculture.

Data analysis

Data were double-entered using Statistical Package for the Social Sciences software (SPSS version 11.5, Chicago, IL, USA) and the two files were compared using Epi Info version 6.4 (Centers for Disease Control and Prevention, Atlanta, GA, USA). Data analysis was performed using the same software. Frequencies and percentages were used to describe the socio-demographic and socio-economic variables and disease and treatment categories of the study population. Mean and median direct (non-transport/transport), indirect and total costs were determined. All costs are presented in $US(2005).*

Ethical approval for this study was obtained from the University of Addis Ababa.

Table 2 Description of the study population

Variables	*n*	%
Sex		
Male	97	52.7
Female	87	47.3
Age, years		
15–24	28	15.2
25–34	79	42.9
35–44	46	25.0
45–54	20	10.9
⩾55	11	6.0
Marital status		
Single	47	25.5
Married	91	49.5
Widowed	23	12.5
Divorced	17	9.2
Separated	6	3.3
Educational status		
Illiterate	32	17.4
Read and write only	5	2.7
Grade 1–6*	33	17.9
Grade 7–8†	27	14.7
Grade 9–12‡	64	34.8
College, university	23	12.5
Primary occupation		
Economically inactive	68	37.0
Daily unskilled labourers	16	8.7
Employed by government	36	19.6
Private and NGO employees	24	13.0
Self-employed business with/without employee	19	10.3
Self-employed merchants, farmers, fishermen, etc.	21	11.4
Patient status		
In-patient	47	25.5
Out-patient	137	74.5
Disease category		
TB patient, HIV status unknown	52	28.3
TB-HIV co-infection	41	22.3
HIV only with no TB	91	49.4
Treatment category (at point of interview)		
TB treatment	77	41.9
ARV treatment	47	25.5
HIV-positive, prevention of TB with isoniazid	33	17.9
HIV-positive, treatment or prevention of OI	27	14.7

* Primary education.
† Junior secondary education.
‡ Senior secondary education.
NGO = non-governmental organisation; TB = tuberculosis; HIV = human immunodeficiency virus; ARV = antiretroviral; OI = opportunistic infections.

RESULTS

A total of 184 patients were successfully interviewed at the three facilities; 50 interviews could not take place due to security conditions in Gondar; 16 interviews were conducted but were removed from the sample because of poor data quality. Table 2 summarises the characteristics of the study population.

The distribution of length of delay was highly skewed, with a few 'long delayers' significantly influencing the mean. Mean and median delays are therefore presented in this study. Median delay from onset of symptoms to arriving at public TB-HIV services was 3.5 months for TB and 1 year for HIV. Table 3 shows treatment delay before accessing TB-HIV services. As with patient delay, patient costs were found to be highly skewed, with a few patients incurring significant costs. Direct costs were found to be most significant (83% of total mean costs). Table 4 shows mean and median pre-treatment costs.

The study found that, on average, 48% of annual household income was lost due to TB treatment. ART caused an average loss of 21% of annual household income in the first year of treatment. The annual direct cost for ART treatment was US$65, with some patients paying for drugs despite the national policy stating that drugs should be free. Patients receiving isoniazid preventive treatment (IPT), CPT or using

* US$1 = 8.7 birr (International Monetary Fund, February 2005).

Table 3 Mean and median time between first complaint and first visit to TB-HIV services

Disease category	Patients *n*	Pre-hospital length of complaint, days	
		Mean	Median
TB only	52	178	105
TB-HIV	41	396	230
HIV only	91	610	365
Total	184	440	180

TB = tuberculosis; HIV = human immunodeficiency virus.

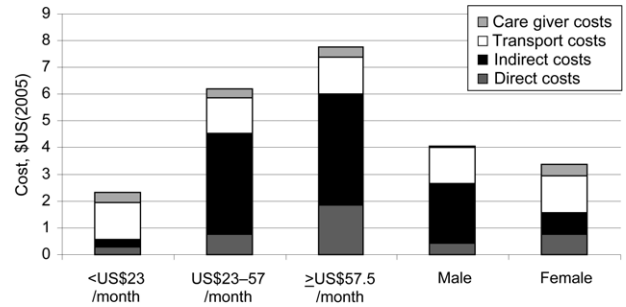

Figure 1 Mean costs for an out-patient visit for tuberculosis patients by income level (in $US 2005) and sex.

voluntary counselling and testing incurred relatively low costs compared to income levels. Table 5 presents patient costs for the main treatment interventions compared to income levels. Males have higher indirect costs (measured as loss of income) than females, while females incur higher direct costs than males. The cost of care givers is also high. The cost for lower-income groups (<US$57.5/month) is less than for higher incomes. Both direct and indirect costs rise as income increases. Figure 1 shows the mean cost per out-patient visit for TB patients by sex and by income.

TB treatment costs during the initial (intensive) phase (first 2 months) and the continuation phase (last 6 months) are shown in Figure 2. Patient costs per visit are high during the intensive phase of treatment, but declined drastically over time. In particular, indirect costs are high during the intensive phase. During the continuation phase, when symptoms are less severe, indirect costs decrease.

DISCUSSION

Our study found that TB and HIV-positive patients suffer substantial financial losses before and during treatment relative to income levels. A long delay in seeking treatment was observed for TB patients (3 months). Delays in seeking treatment were longer

Table 4 Mean and median pre-treatment costs, in $US(2005)

Disease category	Patients *n*	Direct cost (non-transport)		Direct transport cost		Indirect cost		Total cost, mean	Monthly household income, mean	Total cost as % of annual income
		Mean	Median	Mean	Median	Mean	Median			
TB only	52	104	14	16	1	10	0	129	31	35
TB-HIV	41	133	48	14	6	22	9	170	43	33
HIV only	91	243	35	23	3	20	5	287	53	45
Total	184	179	29	19	3	18	3	216	45	40

TB = tuberculosis; HIV = human immunodeficiency virus.

Table 5 Mean treatment costs, in $US(2005)

Treatment category	Direct cost (non-transport)	Direct cost (transport)	Indirect cost	Caregiver cost	Total cost	Monthly household income	Total cost as % of monthly household income
TB treatment smear-positive for out-patients	69	64	78	14	225	38	49
TB treatment smear-positive for in-patients	225	12	70	20	327	38	71
INH prophylaxis for out-patients	15	8	17	2	42	34	10
Cotrimoxazole prophylaxis for out-patients First year of treatment	4	3	4	1	12	60	2
Voluntary counselling and testing	0	1	2	0	3	40	1
Antiretroviral treatment first year of treatment	65	8	67	1	141	55	21
Treatment for OI requiring 1 out-patient visit*	4	2	1	1	8	55	1
Treatment for OI requiring 2 out-patient visits*	8	3	3	2	15	55	2
Treatment for OI requiring 3 out-patient visits*	12	5	4	3	23	55	3
Treatment for OI requiring 4 out-patient visits*	16	6	5	4	31	55	5

*The treatment of most OIs treated in Ethiopia requires between one and four out-patient visits.
TB = tuberculosis; INH = isoniazid; OI = opportunistic infections.

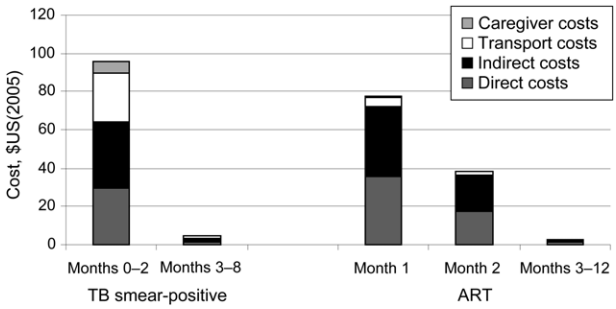

Figure 2 Mean cost per month for TB smear-positive treatment and ART. TB = tuberculosis; ART = antiretroviral treatment.

for HIV-positive patients without TB than for those with TB. This suggests that the first contact of some HIV-positive patients with the health services is for treatment of TB. Treatment-seeking delay was also longer for TB-HIV patients than for patients with TB only. This is likely to be because the proportion of smear-negative TB (usually less symptomatic) compared to smear-positive TB is higher in those patients who also have HIV. These delays result in substantial costs to patients before treatment when seeking and paying for ineffective treatment to relieve their symptoms prior to receiving an accurate diagnosis.

Patient costs, as a percentage of annual income during treatment, are comparable to those in other studies that estimate the economic impact of TB and AIDS.[13–19] Although both TB treatment and ART are free of charge in Ethiopia, we found that many patients still spend considerable sums on diagnostic tests and some patients pay informally for drugs. Direct costs therefore remain high. However, the main cost throughout treatment is loss of income. Income loss is highest at the start of treatment. This is likely to be due to the severity of the disease at this point and the time necessary to access treatment. As treatment progresses, costs fall as patients need to make fewer visits to the hospital. As symptoms improve, income levels begin to rise again. Costs of preventive interventions are lower than for treatment. For example, the costs of IPT and CPT are considerably lower than the costs of TB treatment and treatment of opportunistic infections. The provision of these services is therefore likely to provide an overall economic benefit to the patients and to health services.

This study has a number of limitations. First, although we used standard methods, given that facility-based interviews are considered a valid (and practical) method when estimating patient costs in low-income countries, income levels and indirect costs are difficult to verify (compared to household surveys). Our results are nevertheless broadly comparable to those reported by household-based studies. Second, patient delay and costs before treatment were assessed retrospectively by defining the date of onset of symptoms. Considerable effort was made to identify the point of onset of symptoms using trained medical interviewers. However, for HIV/AIDS patients it is extremely difficult to identify the point of onset, as symptoms are varied and may not be associated with being HIV-positive. Even with TB patients (particularly smear-negative patients), reported delay is difficult to verify. It is difficult to estimate the impact of this uncertainty on our results. Third, our sample primarily consisted of those living near the hospital in an urban setting. This group is likely to have a higher-than-average household income in Ethiopia, and our results may not be representative of lower income groups. Finally, although our methods are standard for facility-based patient cost studies, they do not rely on statistical methods for sampling.

These findings have several policy implications. First, patients face substantial income loss and increased health expenditure at the start of treatment. Exemptions for TB-HIV fees often only apply to drugs and not to the cost of associated diagnostics. Policy makers wishing to ensure that services are truly free should also consider reducing the price of these associated procedures. The economic impact at the household level when starting treatment can be severe. Economic support/incentives are usually provided by TB services to encourage patients to adhere to treatment. However, consideration should also be given to provide social support at this early stage to mitigate the economic impact at the household level of both TB and HIV, particularly for those with low incomes, where these expenditures may be catastrophic.

Second, substantial costs are incurred due to the time and transport required to access treatment. The majority of patients interviewed for our study were locals: 70% lived within an hour's walking distance from the hospital. Nevertheless, these costs remain high. Figure 1 shows that for poor TB patients, transport costs form the most significant proportion of costs. This finding highlights the importance of considering both patient and provider costs when providing services to patients (through communities/primary health facilities/hospitals) in situations where the transport system is poor. Following our study, in 2005, the Ethiopian government began to build up the capacity of primary health care units (PHCUs) to provide TB-HIV services.

Finally, our study found that patients incur high costs before treatment. The relatively high level of direct costs indicates that, although patients recognise that their symptoms need treatment, they do not turn to the TB-HIV services as their first port of call. This study did not specifically address reasons for patient delay, from either the patient or health system perspective. However, it does suggest that efforts to reduce treatment seeking delay not only benefit the health status of the patient, but can also substantially reduce the economic burden on those who are ill. Efforts to intensify case finding for both TB and HIV

through a collaborative TB-HIV programme may reduce the economic burden for those with TB and HIV. In particular, early case finding of HIV-positive cases through TB clinics may reduce the time HIV-positive patients spend seeking relief for their HIV-related symptoms. Further research is needed to see if these potential economic gains can be realised and whether collaborative TB-HIV efforts reduce patient and provider costs over time.

CONCLUSION

This study reports on the costs of TB-HIV services for patients in pilot TB-HIV sites in Ethiopia. It finds that although free TB and HIV treatment costs are substantial, both before and during treatment, they may decrease over time during less intensive stages of treatment. These results can be used to help support TB-HIV services to determine the care models that minimise the economic burden of these illnesses on patients and their families, particularly for those with low incomes.

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RÉSUMÉ

OBJECTIF : Mesurer les coûts-patient des services de tuberculose et du virus de l'immunodéficience humaine (TB-VIH) provenant de trois sites pilote basés sur les hôpitaux lors d'interventions TB-VIH en collaboration en Ethiopie.

MÉTHODES : Les coûts préalables au traitement et

pendant le traitement ont été mesurés pour toute une série de services TB-VIH fournis au sein du programme de collaboration TB-VIH en Ethiopie.
RÉSULTATS : Les coûts-patient s'avèrent substantiels par rapport à leurs niveaux de revenu. Les coûts préalables au traitement représentent 35% du revenu annuel du ménage pour les patients TB (sans VIH), 33% pour ceux atteints de TB et de VIH et 40% pour ceux atteints de VIH (sans TB). Les coûts directs sont particulièrement significatifs au cours de cette période. Les coûts-patient au cours du traitement de la TB s'élèvent entre 49% et 71% du revenu annuel du ménage. Les coûts-patient au cours de la première année du traitement antirétroviral représentent 21% du revenu annuel du ménage. Les coûts diminuent au fur et à mesure des progrès du traitement.
CONCLUSION : Nos résultats illustrent la nécessité de réduire l'impact économique des traitements aussi bien pour la TB que pour le VIH/SIDA sur les patients dans les pays à faibles revenus comme l'Ethiopie. Les services collaboratifs TB-VIH peuvent donner l'occasion de réduire les coûts préalables au traitement en mettant à disposition un canal additionnel du diagnostic précoce du VIH. Les coûts et l'impact économique peuvent être réduits davantage en garantissant que les diagnostics et les traitements seront fournis à titre gratuit, en assurant un soutien social particulièrement au début du traitement et en rapprochant les services du patient.

RESUMEN

OBJETIVO: Medir los costos para el paciente en los servicios de atención de la tuberculosis y la infección por el virus de la inmunodeficiencia humana (VIH-TB) en tres centros hospitalarios piloto de la atención conjunta de la VIH-TB en Etiopía.
MÉTODOS: Se midieron los costos durante el tratamiento y los costos anteriores al mismo de una variedad de servicios prestados como parte del programa conjunto TB-VIH en Etiopía.
RESULTADOS: Los costos para el paciente eran considerables, comparados con el nivel de los ingresos. Los costos previos al tratamiento equivalían al 35% del ingreso familiar anual de los pacientes tuberculosos (sin el VIH), al 33% del ingreso de pacientes con TB e VIH y al 40% del ingreso de los pacientes con el VIH (sin TB). Los costos directos fueron particularmente altos. Los costos del paciente durante el tratamiento antituberculoso oscilaron entre el 49% y el 71% del ingreso familiar anual. Los costos para el paciente durante el primer año del tratamiento antirretrovírico correspondieron al 21% del ingreso familiar anual. Los costos disminuyeron a medida que progresaba el tratamiento.
CONCLUSIÓN: Estos resultados destacan la necesidad de mitigar la repercusión económica del tratamiento de la TB y la infección por el VIH y el SIDA en los pacientes de países con bajos ingresos como Etiopía. Los servicios de atención conjunta de la TB y el VIH podrían constituir la ocasión de disminuir los costos previos al tratamiento, al ofrecer canales complementarios de diagnóstico temprano de la infección por el VIH. Los costos y el impacto económico se podrían disminuir aún más, si se consigue ofrecer el diagnóstico y el tratamiento sin costo alguno además del apoyo social, en particular al comienzo del tratamiento y se prestan los servicios más cerca de los pacientes.