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Time and money: the true costs of health care utilization for patients receiving 'free' HIV/TB care and treatment in rural KwaZulu-Natal

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Abstract

Background—HIV and TB services are provided free-of-charge in many sub-Saharan African countries, but patients still incur costs.

Methods—Patient-exit interviews were conducted with a representative sample of 200 HIV-infected patients not yet on ART (pre-ART), 300 ART patients, and 300 TB patients receiving public sector care in rural South Africa. For each group, we calculated health expenditures across different spending categories, time spent traveling to and utilizing services, and how patients financed their spending. Associations between patient group and costs were assessed in multivariate regression models.

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Authors' contributions

The authors NC, TB, MLN, RB, ML, FT, SD and JH contributed to the conception of the study. NC, MLN, JB and TB contributed to the conception and design of the article, drafting the article and revising it critically. NC did the acquisition of data, TB, JB and NC did the analysis and interpretation of data. RB, ML, FT, SD, DP, JB and JH critically reviewed the article. All authors have read and approved the final manuscript.

Results—Total monthly health expenditures (1 USD = 7.3 South African Rand, ZAR) were: ZAR 171 (95% CI 134, 207) for pre-ART, ZAR 164 (95% CI 141, 187) for ART, and ZAR 122 (95% CI 105, 140) for TB patients (p=0.01). Total monthly time costs (in hours) were: 3.4 (95% CI 3.3, 3.5) for pre-ART, 5.0 (95% CI 4.7, 5.3) for ART and 3.2 (95% CI 2.9, 3.4) for TB patients (p<0.01). Though overall patient costs were similar across groups, pre-ART patients spent on average ZAR 29.2 more on traditional healers and ZAR 25.9 more on chemists and private doctors than ART patients, while ART patients spent ZAR 34.0 more than pre-ART patients on transport to clinics (p<0.05 for all results). 31% of pre-ART, 39% of ART and 41% of TB patients borrowed money or sold assets to finance health costs.

Conclusions—Patients receiving nominally free care for HIV/TB face large private costs, commonly leading to financial distress. Subsidized transport, fewer clinic visits, and drug pickup points closer to home could reduce costs for ART patients, potentially improving retention and adherence. Large expenditure on alternative care among pre-ART patients suggests that transitioning patients to ART earlier, as under HIV treatment-as-prevention policies, may not substantially increase patients' financial burden.

Keywords

Borrowing; selling assets; financial distress; healthcare costs; HIV; TB; out-of-pocket; health expenditure; time use; South Africa; ART; pre-ART; retention; costs

Introduction

South Africa has the largest number of people infected with Human Immunodeficiency Virus (HIV) worldwide[1] and the largest public antiretroviral therapy (ART) programme in the world.[2,3] Tuberculosis (TB) is among the leading causes of morbidity and mortality in South Africa and a common opportunistic infection in HIV patients.[1,4]

The South African Department of Health (DoH) has made both TB treatment and HIV care and treatment free of charge in public healthcare facilities to increase treatment accessibility.[5,6] However, HIV and TB patients may still face financial hardships due to other healthcare-related expenditures, such as transport to and from the clinic, food and in some cases overnight accommodation near the clinic, expenditure on alternative sources of care including private doctors, pharmacies, and traditional healers, and income losses due to time spent seeking care.[7,8] In this study, we are thus aiming to establish the true costs of health care utilization for patients receiving 'free' HIV/TB care and treatment in rural KwaZulu-Natal.

Previous research suggests that patients bear costs – in both time and money – not captured in clinic fees. Routine surveillance data collected annually in the study area shows that the median time taken to travel to the nearest clinic is 81 minutes and the common mode of transport for most patients is by mini-bus taxis.[9,10] These expenditures can lead to financial distress for patients already living in poverty. People may forego essential services to pay for healthcare, borrow money from relatives, or friends; or resort to selling of assets, contributing to longer-term impoverishment.[11–15] For HIV care and treatment in particular,

time losses and out-of-pocket payments could amount cumulatively to very large sums, as treatment is life-long.[13,14]

A key contribution of this study is the ability to compare health expenditures across both pre-ART and ART patients. Research focused on the health expenditures of pre-ART patients is scarce, yet it is important because it can provide insight into the barriers to retention during the pre-ART stage[3] and patients' willingness and ability to transition to ART initiation when eligible.[7] If ART initiation is associated with higher patient costs, e.g. due to the higher frequency of clinic visits, then this may discourage pre-ART patients from remaining in care and lead to later-than-optimal initiation of ART. On the other hand, if patients experience high out-of-pocket expenditures in pre-ART care, e.g. due to treatment of opportunistic infections, then ART initiation could be a financially attractive option and demand for earlier initiation could be high.[3,16] The relative costs to patients of pre-ART vs. ART have significant implications for the successful roll-out of treatment-as-prevention (TASP) programmes.

To provide insight into the true costs of healthcare seeking for public sector patients, we set out to measure the financial and time-related costs of healthcare utilization among patients receiving 'free' pre-ART, ART, and TB services primary care clinics in rural South Africa. We assessed costs associated both with accessing public sector care and with their complementary utilization of traditional healers and private providers. Finally, we assessed whether these expenditures led to financial distress, as indicated by borrowing money or selling assets to finance care.

Methods

Study area and health systems context

We carried out the study within the public sector ART programme of Hlabisa sub-district, situated in northern KwaZulu-Natal, South Africa. HIV prevalence among adults in the rural Hlabisa sub-district of KwaZulu-Natal in 2010 was 29%[17] with incidence remaining high despite recent reductions in mortality and HIV acquisition due to the scale-up of ART.[18–22] TB prevalence was almost 25% among those initiated on ART in 2006, and the population TB notification rate approximately 928 cases per 100 000 in 2009, with evidence of emerging drug-resistance.[23]

Since 2004, the Hlabisa HIV Treatment and Care Programme (ART programme) has provided free HIV treatment and care in 17 (16 at the time of the study) primary healthcare (PHC) clinics in the sub-district; the programme works in partnership with the DoH-TB programme to provide free TB treatment in the same PHC clinics.[24] The sub-district is predominantly rural, about 90% of the population living in rural area, with pockets of urban and peri-urban areas, with a population of approximately 228 000 individuals. All PHC clinics within the ART programme (www.africacentre.ac.za)[24] operate in accordance with the South African DoH guidelines on HIV and TB management.[5,23–26]

Both HIV and TB care and treatment require repeated clinic visits to diagnose and manage these infections, ART and TB treatment can be collected on the same visit for co-infected

patients. All PHC clinics offer HIV counseling and testing.[24,27,28] When a patient tests positive, blood samples are sent to the Hlabisa National Health Laboratory Services (NHLS) for CD4 cell count measurement and patients return to the clinic for their results within a week from sample collection. Individuals who are not yet eligible for ART are instructed to return to the clinic every six or 12 months, depending on CD4 count.[29] ART eligible patients attend three adherence counselling sessions and then initiate therapy. ART patients visit the clinic monthly in the first year to refill medications and for clinical observation and every two months thereafter if they are stable on treatment.

Sputum from patients with suspected TB is sent to the NHLS for acid-fast bacilli (AFS) smear testing.[25,26] All smear-positive patients are initiated onto first line standard TB regimen and patients with negative smear who remain symptomatic are referred to Hlabisa district hospital for further assessment. TB patients collect treatment monthly from the PHC clinic; multi-drug (MDR) and extensively-drug (XDR) resistant TB cases are hospitalized for one to two months with further follow-up at PHC clinic.

Data sources and sampling

We measured the financial and time-related costs of health care utilization among patients utilizing free pre-ART, ART, and TB services and other private healthcare services. Data were collected through exit interviews with 800 HIV and TB patients, with patients sampled to be representative of the patient population in the Hlabisa sub-district public sector health system. Data were collected on a wide range of health-related expenditures and time spent seeking clinical care. To assess whether these expenditures led to financial distress, we collected information on whether patients reported either borrowing money or selling assets to finance healthcare utilization.

We collected data in patient-exit interviews at the HIV and TB facilities from two cross-sectional surveys in the sub-district. First, a multi-site study called Researching Equity in ACcess to Healthcare (REACH)[15] was conducted in 2009, focusing on patients utilizing ART and TB services in PHC clinics. The ART and TB questionnaires were constructed using questions on access to healthcare that have been used, validated and subjected to reliability analyses in multiple studies in sub-Saharan Africa (www.wits.ac.za/pdf/10500/10500_chp_10500_reach.pdf.).[15,30–32] We used the questions about patient affordability to establish the direct and indirect healthcare utilization expenditures in the study populations. The questionnaires were structured such that we started with simple and nonthreatening questions and ended with questions that were more sensitive or more difficult to answer.

Second, we extended the study to HIV-infected people not yet eligible for ART within the same PHC clinics in 2010 in Hlabisa sub-district only. We focused this paper on findings from Hlabisa sub-district where we had pre-ART data. We used a two-stage cluster random sampling approach, first selecting a random sample of PHC clinics within the sub-district (with replacement) drawn with a probability proportional to size and then randomly sampling 60 patients in each facility in the second stage. The sample size for the final sampling unit (300 ART and 300 TB patients) was established through a formal power calculation to ensure a sufficiently large sample to detect significant differences in several

key indicators, while accounting for the expected clustering of indicator values at the level of the PHC clinics where we approached patients for the interviews. Pre-ART patients (sample size 200) were randomly selected from the clinics included in the REACH study. To be included in the ART group, patients had to be on ART for at least two weeks; to be included in the TB group patients had to have been on TB treatment for at least 2 months; pre-ART patients had to be ART naive. Four trained fieldworkers conducted the patient-exit interviews using the local language in the study area, *isiZulu*. The questionnaires were translated from English to Zulu and back-translated to English by trained research members to ensure that meaning and consistency were maintained in the translation. All four fieldworkers were native Zulu-speakers, and all four had previously been trained and worked as fieldworkers in the population-based surveillance at the Africa Centre for Health and Population Studies. During the fieldwork, the study coordinator debriefed and discussed challenges with the fieldworkers. The study coordinator also continuously checked the interview forms for completeness and quality and provided feedback on interview issues to the fieldworkers once per week.

Ethics approval

We received ethical clearance for this study from the University of KwaZulu-Natal (BF072/09 and BE174/08). We obtained written informed consent from all participants. Interviews were done within the clinic premises but in a separate space outside the facility to ensure privacy and confidentiality for all participants.

Measures

Data were collected on health-related financial expenditures, time spent traveling to and utilizing clinical services, and methods patients used to finance their care.

(1) Financial expenditures—We collected data on expenditures on three broad categories: costs of visits to the clinic, costs of other healthcare services, and costs associated with self-care, each of which had a number of sub-categories. Expenditures associated with clinic visits were assessed on a per-visit basis. Patients were asked: *"In coming to receive treatment today, how much did you pay for: transport (one way), clinic/ hospital fees, medicines, someone to take over your tasks while you are here including childcare, accommodation if you need to stay the night nearby, food during the visit, telephone, other, specify."* In addition patients were asked *"Did you find it easy or difficult to incur these expenses?"* Since most ART and TB patients had one visit per month, these single episode costs were taken to be monthly costs of seeking care at the clinic. To allow for the different visit schedules, we translated pre-ART patients' per clinic visit financial and time costs to monthly costs by dividing the financial and time costs by three (on average pre-ART patients are expected to make four clinic visits per year for CD4 count and clinical monitoring).[5,29] Costs associated with other healthcare services and self-care were assessed with reference to the past four weeks. With respect to other healthcare services, patients were asked about utilization and expenditure on *"chemist/pharmacy, private doctor, traditional healer, other public or private hospital/clinics – inpatient stay or emergency/ outpatient department."* To capture costs associated with self-care, we asked patients to report expenditure on "*any other healthcare in the past month (e.g. traditional medicines,*

spaza shop (convenience store), special food etc)".[33] The above health expenditures were aggregated to calculate "total expenditures in the last four weeks". All expenditures were reported in South African Rand (USD 1 = ZAR 7.3, at the time of the study in 2010). We standardized the ART and TB patients' costs to 2010 for comparability with pre-ART patient costs taking into account inflation.[34,35]

(2) Time costs—Data were also collected on time-related costs associated with clinic visits. Data were collected on time (in hours) spent traveling to the clinic, and time spent at the clinic from the questions: *"How much time did you spend at the clinic last time you came to collect your ARV or TB treatment?"* and *"How long did it take you to get here? (one way only) time taken from leaving home to arriving at facility?"* Round-trip transit and utilization times were aggregated to calculate "total time costs" associated with clinic visits. As with financial costs, we divided pre-ART time costs by three to adjust for the different visit schedules.[5,29]

To enable comparisons between time and financial costs, we converted time spent in hours into equivalent monetary expenditure using an estimate of the opportunity cost of time. We calculated the rate of income per hour worked by dividing the Gross Domestic Product (GDP) per capita for KwaZulu-Natal with the working hours per year and obtained an average hourly wage of ZAR 17.49.[36,37] Evidence from the study setting finds 90% recovery of baseline employment levels among patients established on ART.[38] To obtain time costs in Rand, we multiplied the monthly time spent during clinic visits and the travel times to the facility for pre-ART, ART and TB patients by ZAR 17.49. We note that estimating the value of time in settings with very high unemployment is difficult and therefore we present time costs in hours as our main results.

(3) Financing patient expenditures—Patients were asked how they paid for medical care from the questions *"In the last month did you have to borrow money to pay for healthcare?"* and *"In the last month did you have to sell personal or household items in order to pay for healthcare?"* We constructed an indicator of "financial distress", which took the value of one if individuals reported either borrowing money or selling personal or household items to pay for healthcare in the last month and zero otherwise.[13,15] Disability grants data was only available for ART and TB patients; most pre-ART patients are not eligible (and are not encouraged to apply) for the disability grants under the inability to work due to illness criteria unless they meet the criteria for reasons unrelated to their HIV infection. The question on disability grants was thus omitted for this group.[39,40]

Analysis

The analysis proceeded in three steps. First, we used standard descriptive statistics to describe patient socio-demographic characteristics, and to summarize average time-related costs, financial costs, and financial distress indicators for pre-ART, ART and TB patients. Second, to investigate whether patient type (pre-ART vs. ART vs. TB) was associated with differences in patient costs, we estimated multivariate regression models controlling for socioeconomic covariates and clustering standard errors at the clinic level. Third, we assessed the association between patient costs and financial distress in multivariate logistic

regression models, controlling for socio-demographic characteristics and accounting for clustering at clinic level. We estimated separate logistic regression models for pre-ART, ART and TB patients and a pooled model for all three groups; and we obtained predicted marginal effects after each model. When modeled as exposures, costs were expressed per ZAR 100. All analyses were carried out using STATA version 11[41] and values of $p<0.05$ were considered significant.

Results

Patients' characteristics

Pre-ART patients were more likely to be female (79% pre-ART, 62% ART and 53% TB) and were significantly younger than ART and TB patients (Table 1). ART patients had been on treatment for more than a year, on average 19 months (95% CI 17.3, 20.5); and an average most recent CD4 count of 347.9 cells/mm^3 (95% CI 321, 375) cells/mm^3. The majority of TB patients (75%) reported it was their first episode of TB, 83% having pulmonary TB and 17% extra pulmonary TB. The majority of ART (92%) and TB (89%) households (no data was available for pre-ART patients) were receiving social grants from the government, with ART households receiving a significantly higher average grant amount than TB households (Table 1).

Patient expenditures and time-costs associated with clinic visits

(1) Financial expenditures—For all groups, transport was the largest expense associated with clinic visits, with a monthly cost of: pre-ART (ZAR 5; 95% CI 4, 6), ART (ZAR 37; 95% CI 29, 45) and TB patients (ZAR 24; 95% CI 21, 28) (Table 2). 63% of ART and 57% of TB patients reported using public transportation to and from the clinic (mode of transport data was unavailable for pre-ART patients). Food costs during the clinic visit also contributed to monthly expenditures associated with clinic visits: pre-ART (ZAR 2; 95% CI 2, 3), ART (ZAR 9; 95% CI 8, 10) and TB patients (ZAR 6; 95% CI 5, 8). None of the patients paid for medicines, and small amounts were reported to have been spent on childcare, overnight accommodation, cell phone airtime, and on clinic/hospital fees (although HIV/TB services are provided free-of-charge – there is need for further investigation what the fees were for). Total monthly costs of clinic visits (excluding time costs) were higher for ART patients (ZAR 46; 95% CI 38, 55) and TB patients (ZAR 33; 95% CI 27, 39) than for pre-ART (ZAR 8; 95% CI 6, 9), largely due to the frequency of visits. (Table 2) The majority of patients indicated it was difficult to bear these expenses (pre-ART 135 (81%), ART 203 (86%) and TB 185 (92%) $p=0.01$).

Including non-clinic based health expenditure, patients in the three groups spent about the same amount of money per month on healthcare (per clinic visit costs combined with expenditures on other healthcare services) – ZAR 171 (95% CI 134, 207) for pre-ART patients, ZAR 164 (95% CI 140, 187) for ART patients, and ZAR 122 (95% CI 104, 140) for TB patients (Table 2). However, the three patient groups differed widely in the composition of their financial expenditures: pre-ART patients spent more on traditional healers, chemists, and private doctors (Figure 1, Table 2) compared to their counterparts; although they spent less on transport. All three groups reported large expenditures on self-

care (Table 2). These results held up in multivariate regression, after controlling for socio-demographic characteristics (Table 3). Pre-ART patients spent less on transport costs (−34.0; 95% CI −57.0, −11.0) than ART patients. However, pre-ART patients spent significantly more on traditional healers (29.2; 95% CI 12.2, 46.2) and private chemists/ private doctors (25.9; 95% CI 10.3, 41.6) than ART patients, who spent very little on traditional, complementary, or alternative sources of care.

(2) Financing patient expenditures—For a single clinic visit, pre-ART patients reported spending significantly more hours at the clinic (3.5; 95% CI 3.2, 3.8) than both TB (1.1; 95% CI 1.0, 1.3) and ART patients (2.8; 95% CI 2.5, 3.0); ART patients spend significantly more time than TB patients. However, the translated average monthly time spent at the clinic for pre-ART patients (1.2; 95% CI 1.1, 1.3 hours) was much lower than the monthly time spent at the clinic for ART patients. There was no significant difference in the average travel time for a return trip to the clinic across the groups (Table 2).

(3) Financing patient expenditures—About one-third of patients borrowed money in the last month to pay for healthcare: 39% of TB patients, 29% of pre-ART patients, and 36% of ART patients. Fewer than one-tenth of patients had sold personal or household items to finance health expenditures (Table 2). There was no difference in average amount borrowed across all patient groups; pre-ART patients ZAR 178 (95% CI 128, 229; median 100; interquartile range [IQR] 50, 200), ART patients ZAR 177 (95% CI 97, 256; median 104; IQR 42, 209) and TB patients ZAR 154 (95% CI 108, 201; median 94; IQR 31, 209). Financial distress (as indicated by either borrowing or selling assets) was high in all groups: TB patients (41%), pre-ART (31%), and ART (39%) (Table 2).

Factors associated with financial distress due to utilizing healthcare

Being male or having an unemployed head of household among pre-ART patients was associated with more than twice the odds of being financially distressed (Table 4). Computing marginal effects, for each ZAR 100 in financial expenditure, the probability of reporting financial distress increased by 6.6 percentage points (95% CI 4.9, 8.3). For every hour spent at the clinic utilizing healthcare, the probability of reporting financial distress increased by 5.5 percentage points (95% CI 3.4, 7.6).

Discussion

We show evidence of high healthcare-related expenditure and time costs among adults utilizing public sector HIV and TB services, even though these services are provided free at point of service. Monthly private health expenditures were estimated at ZAR 171 for pre-ART patients, ZAR 164 for ART patients, and ZAR 122 for TB patients. From the patient perspective, these expenditures are very large, especially in a study area with high unemployment rates and dependency on social grants, representing over a third of median per capita income (ZAR 401) among Zulu-speaking South Africans.[42] In this light, it is not surprising that 31–41% of our sample reported that health expenditures led to financial distress, with many patients driven into debt by health expenditures. Furthermore, and contrary to popular perception, patients' private contributions are a significant component of

total spending for public sector care. Including the public sector contribution to ART treatment – estimated at US$ 682 (ZAR 4979) per patient per year at the facility level[43] – ART patients' private health expenditures represent over a quarter of the full cost of a patient being on ART. In addition to financial expenditures, patients face substantial time costs associated with care-seeking, primarily due to the time required to travel to clinic visits. These patient costs are very likely large enough to influence uptake, adherence, and retention on HIV and TB treatment. Interventions to reduce the private costs of care could increase early treatment initiation and sustained viral suppression with benefits for patients and potentially-large spillover effects in reducing onward transmission.

A critical gap in the HIV cascade of care has been the transition from pre-ART to ART, with high attrition from pre-ART care[3,44,45] and many patients still initiating ART at low CD4 counts.[3,45] One common explanation for this gap is the perception that the patient-borne costs of ART are significantly higher than the costs during pre-ART due to the burden of frequent and lengthy clinic visits to pick up medicines, and that these costs discourage patients from initiating as early as they might. This theory, in this setting, appears to be a canard. Costs for ART patients were indeed large. However, expenditures were as high – if not higher – for pre-ART patients, who spent significant private resources on traditional healers, chemist/pharmacy and private doctors. Use of alternative healthcare providers is common in South Africa and can result in hidden costs of illness that are not captured in facility-based costing studies.[7,15,46,47] We find that that demand for some form of treatment is high, and that HIV patients, if not yet eligible for ART, tend to seek alternative (and likely less efficacious) forms of therapy.[47,48]

Much has been made of the pattern in which HIV patients utilize both ART and traditional, complementary, and alternative medicines simultaneously.[47] Interestingly, private expenditures on alternative sources of care all but disappeared for patients who had initiated ART, suggesting that in fact ART and alternative medicines may be substitutes rather than complements in this population.[7,15,46,47] A likely explanation is that once patients initiated ART, they no longer had the symptoms for which they were seeking alternate sources of care. These findings have powerful implications for the rollout of TASP, suggesting that demand for early ART may be higher than previously thought and that initiating ART may not impose large financial burdens on patients, but rather relieve them from other health expenditures on less efficacious therapies. Reports of financial distress, though common, did not differ significantly between pre-ART and ART patients, alleviating concerns that TASP strategies may increase the financial burden of healthcare for patients and lead to low uptake.

Transport was the single largest cost component for all patients groups per clinic visit, similar to what has been reported elsewhere, and contributed to high expenditures among ART and TB patients who have frequent clinic visits.[8,14,15,49] Most patients use public or private arranged transport to visit the clinic,[7,10] but road networks are poor in most rural areas making it costly to access some clinics.[50] In the general population in the study area, most patients (61%) walked to clinic and 39% used public transport.[9] Both TB and ART patients have monthly clinic visits for treatment collection while those not yet eligible for ART make about four clinic visits per year for CD4 count monitoring and treatment

eligibility assessment. Two of these four visits are for physical examination and blood taking for CD4 counts; the other two are to receive the CD4 count results and to decisions on treatment eligibility. Interventions to reduce transport costs, e.g., a medicine delivery service, less frequent clinic visits for stable patients, or transport vouchers for poor households could substantially improve patient welfare and lead to better treatment outcomes.[51,52] Importantly, because ART patients have more frequent clinic visits than pre-ART patients, any reductions in transport costs associated with clinic visits will lower the relative cost of ART from the patient perspective and could lead to even greater demand for early ART.

Our study had some limitations. First, due to the nature of the clinic-based sampling strategy, we excluded people in need of healthcare who did not access healthcare, including those who did not access healthcare because they could not afford it. In previous research, we find that distance to the nearest clinic strongly predicts take up of ART, suggesting that transport costs may discourage some from seeking care.[53] The long run costs of forgoing care may be substantial, but are excluded from this analysis. Secondly, it is possible that our cross-sectional comparisons across patient types – pre-ART, ART, and TB – were confounded by unobserved factors. We controlled for employment status of household head and basic demographics; further, by design, all three groups are patients who have sought clinical care for HIV or TB. However, as in most observational studies, unmeasured factors could influence our effect estimates. Third, time costs associated with care-seeking outside the clinic were not assessed in the survey and could not be included in the analysis. Given the higher utilization of alternative care among pre-ART patients, this omission would bias pre-ART patient costs downwards, implying that one of our main conclusions – that pre-ART is just as costly to patients as ART – is still valid and may actually underestimate the cost-savings to patients of initiation ART. Fourth, in this study, we have assessed the costs of health care utilization from the perspective of individual patients. An important additional perspective is the costs of patients' health care utilization to their households. While our study focused on the individual, our findings that large proportions of patients reported that they had to borrow money or sell assets in order to pay for health care is likely to imply substantial household financial burdens due to patients' health care utilization for pre-ART, ART and TB. In particular, assets – such as livestock, bicycles, tables or televisions – are commonly shared among household and even community members, and their sale thus likely affects people who are socially linked to the patients we have interviewed here. The spillover effects of health care utilization to household and community members are an important area of future research, including the broader impacts on household activities, time use, and economic status. Lastly, pre-ART data was limited and available for only one district thereby confining our analysis to this one sub-district. Although we report on just one rural area, we note that the study setting has many characteristics common to rural areas in South Africa and the countries immediately surrounding: extensive use of traditional healers, a robust public health sector, a socioeconomic context of high cyclical migration and unemployment, and a very high HIV burden. Further research will be needed to demonstrate generalizability to other settings.

HIV and TB patients receiving nominally free care nevertheless face considerable costs due to healthcare expenditures and the time costs of seeking care. Interventions to reduce patient

costs could improve progression through the HIV cascade of care.[54,55] ART patients have much lower expenditures than pre-ART patients on traditional healers, private doctors, and pharmacies, suggesting that ART as a substitute for alternative treatments. These findings imply high demand for health care among HIV patients and that initiating patients earlier onto ART could be cost-saving for the patient – in addition to yielding health benefits for the patient[56] and for society at large.[22,57]

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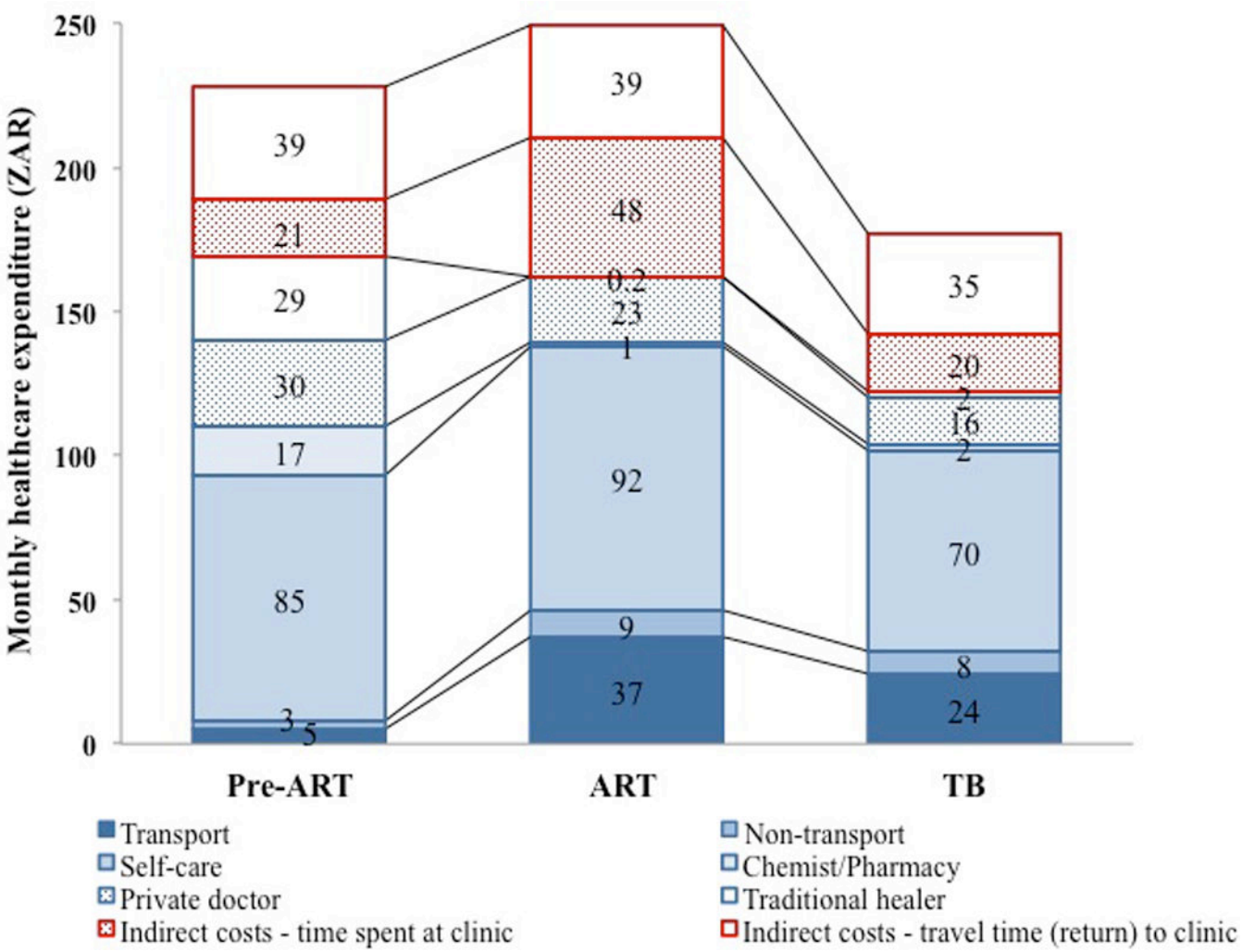

Figure 1.

Average monthly direct and indirect costs (ZAR) incurred by pre-ART, ART and TB patients attending clinic visits (transport costs, and non-transport costs – clinic/hospital fees, childcare, overnight accommodation, food, cellphone airtime); costs of utilizing the chemist/pharmacy, private doctor and traditional healer, and self-care costs (use of traditional medicine, spaza shops, and special foods), indirect costs (time spent at clinic and travel time to the clinic).

Self-care (use of traditional medicine, spaza shops, and special foods)

Chemist/Pharmacy (use of the chemist/pharmacy)

Private doctor (use of the private doctor)

Traditional healer (use of the traditional healer)

Transport (transport cost for a return trip to clinic)

Non-transport (costs of clinic/hospital fees, childcare, overnight accommodation, food, cellphone airtime)

Indirect costs (time spent at the clinic)

Indirect costs (travel time (return) to the clinic)

Table 1

Characteristics of pre-ART, ART and TB patients

Characteristics	Pre-ART N=200	ART N=300	TB N=296	p-value
Sex (% Male)	21	38	47	<0.001*
Age (mean in years, SD in brackets)	33 (10)	40 (10)	38 (12)	<0.001†
Head of household employment status (% unemployed)	73	86	81	0.002*
Households receiving grants‡ (% Yes)	–	92	89	0.113*
Household grant value‡ (mean in ZAR, SD in brackets)	–	1503 (974)	1198 (922)	<0.001†

‡Data on grants not available for pre-ART patients.

*p-value based on Pearson's χ^2 test for differences in proportions across patient groups.

†p-value based on F statistic test for differences in means across patient groups.

ZAR = South African Rand, ART = antiretroviral treatment, TB = tuberculosis, SD = standard deviation.

Table 2

Descriptive table of financial costs, time costs, total costs and financial distress

Financial and time costs (per month)	Pre-ART N=200 Mean (SD)	ART N=300 Mean (SD)	TB N=296 Mean (SD)	p-value‡
Costs associated with visits to HIV/TB clinic (ZAR/month)				
Transport costs (return trip)	5.0 (6.8)	36.9 (67.4)	24.4 (29.4)	<0.001
Non-transport costs	2.7 (3.8)	9.4 (11.7)	8.2 (36.1)	0.004
Subtotal	**7.6 (8.5)**	**46.4 (71.8)**	**32.7 (52.0)**	**<0.001**
Costs incurred for use of other healthcare services (ZAR/month)				
Chemist or pharmacy	17.4 (81.9)	0.8 (4.7)	2.0 (16.6)	<0.001
Public clinic	0.8 (10.6)	0.7 (8.1)	0.7 (10.8)	0.999
A private doctor	30.2 (77.7)	23.4 (82.8)	15.5 (55.3)	0.081
A traditional healer	29.1 (117.1)	0.2 (3.0)	1.5 (14.9)	<0.001
Public hospital	1.0 (7.8)	0.4 (4.0)	0.0 (0.0)	0.053
Private hospital	0.1 (1.4)	0.0 (0.0)	0.1 (1.2)	0.520
Self-care-traditional medicines, spaza shops, special foods	84.5 (141.2)	91.7 (153.0)	69.8 (118.5)	0.145
Subtotal	**163.1 (262.5)**	**117.3 (181.3)**	**89.5 (139.8)**	**<0.001**
Total financial costs	**170.7 (262.9)**	**163.7 (204.0)**	**122.2 (154.7)**	**0.012**
Time costs (hours/month)				
Time spent at clinic	1.2 (0.7)	2.8 (2.0)	1.1 (1.3)	<0.001
Time spent travelling	2.2 (1.8)	2.2 (1.8)	2.0 (1.5)	0.105
Total (hours/month)	**3.4 (0.7)**	**5.0 (2.8)**	**3.1 (2.0)**	**<0.001**
Total monetized time costs (ZAR/month)	**59.2 (12.7)**	**87.1 (49.4)**	**54.7 (35.2)**	**<0.001**
Total financial + monetized time costs (ZAR)	**230.2 (262.7)**	**250.7 (218.5)**	**177.0 (158.5)**	**<0.001**
Financing health expenditure (% yes)				
Borrowed money	29 (22–35)	36 (31–42)	39 (33–45)	0.054¥
Sold assets§	5 (2–7)	8 (5–11)	6 (3–9)	0.365¥
Borrowed money OR sold assets to pay for healthcare†	31 (24–37)	39 (34–45)	41 (35–47)	0.051¥

* Time spent at clinic for pre-ART patients was divided by 3 to allow for the number of visits for pre-ART patients; for ART and TB patients their visits are monthly.

** Time cost were calculated as time spent per-visit or time travelling multiplied by ZAR 17.49.

Sample was §282 and †296 for ART patients due to missing data.

¥ p-value based on Pearson's χ^2 test for differences in proportions across patient groups.

‡ p-value based on F statistic test for differences in means across patient groups.

ZAR = South African Rand, ART = antiretroviral treatment, TB = tuberculosis, SD = standard deviation.

Table 3

Crude and covariate-adjusted differences in health expenditures by patient type and spending category

	Total financial health expenditure	Transport	Traditional healers	Self-care	Chemist and private doctors	Time costs (monetized)
	Mean (95% CI) p-value	Mean (95% CI) p-value	Mean (95% CI) p-value	Mean (95% CI) p-value	Mean (95% CI) p-value	Mean (95% CI) p-value
Crude difference						
Pre-ART *minus* ART	7.1 (−46.2–60.4) 0.747	−32.0 (−54.1–9.8) 0.014	28.9 (12.4–45.3) 0.006	−7.2 (−37.9–23.5) 0.572	23.4 (6.7–40.1) 0.016	−27.9 (−38.8–17.1) 0.001
TB *minus* ART	−41.5 (−106.8–23.9) 0.164	−12.5 (−35.8–10.8) 0.227	1.2 (−0.7–3.2) 0.158	−22.0 (−58.9–15.0) 0.187	−6.7 (−11.7–1.7) 0.018	−32.4 (−52.5–12.3) 0.009
Adjusted difference*						
Pre-ART *minus* ART	1.3 (−57.0–59.7) 0.955	−34.0 (−57.0–11.0) 0.013	29.2 (12.2–46.2) 0.007	−13.2 (−46.0–19.7) 0.350	25.9 (10.3–41.6) 0.008	−26.7 (−38.0–15.3) 0.002
TB *minus* ART	−41.2 (−103.2–20.7) 0.148	−12.6 (−34.7–9.5) 0.203	1.2 (−1.8–4.2) 0.340	−23.8 (−59.2–11.7) 0.145	−4.9 (−9.0–0.8) 0.029	−31.5 (−51.4–11.6) 0.010

* Controlling for age, sex, head of household employment status and adjusted for clustering at the clinic level. All values are in South African Rand.

CI = confidence interval, ART = antiretroviral treatment, TB = tuberculosis

Table 4

Factors associated with financial distress due to utilizing healthcare in pre-ART, ART and TB patients

	Pre-ART N=200		ART N=294		TB N=295		All patient groups N=789	
Patient either borrowed money or sold assets to pay for health care	**aOR**	**95% CI***	**aOR**	**95% CI***	**aOR**	**95% CI***	**aOR**	**95% CI***
Male sex	2.40	1.14–5.05	1.09	0.63–1.88	1.15	0.54–2.45	1.29	0.92–1.79
Age (in years)	0.99	0.97–1.02	0.98	0.96–1.01	1.01	0.97–1.04	1.00	0.98–1.01
Head of household unemployed	1.97	1.21–3.22	1.49	0.52–4.27	2.31	0.78–6.87	1.86	1.22–2.85
Total monthly costs of utilizing healthcare (per ZAR 100)	1.40	1.19–1.65	1.32	1.18–1.47	1.54	1.25–1.90	1.38	1.26–1.51
Time spent during clinic visit per month (in hours)	1.04	0.92–1.17	1.21	1.05–1.40	1.65	1.22–2.24	1.31	1.17–1.45
Pre-ART		–		–		–	1.10	0.69–1.73
TB		–		–		–	1.92	1.29–2.87

* Adjusted for clustering at the clinic level. Hosmer-Lemeshow goodness-of-fit test for pre-ART model p=0.46; ART model p=0.35; and TB model p=0.06.

** Marginal effects of the regression with all patient groups: change in total monthly costs of utilizing healthcare per ZAR 100 = 6.6 percentage points (p-value<0.001, 95% CI 4.9–8.3); change in time spent during clinic visit per month (hours) = 5.5 percentage points (p-value<0.001, 95% CI 3.4–7.6).

CI = confidence interval, aOR = adjusted odds ratio, ZAR = South African Rand, ART = antiretroviral treatment, TB = tuberculosis.