Economic Costs of Patients Attending the Prevention of Mother-to-Child Transmission of HIV/AIDS (PMTCT) Services in Ethiopia: Urban-Rural Settings

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Abstract: Economic analyses of patients' costs are pertinent to improve effective healthcare services including the prevention of mother-to-child HIV/AIDS transmission (PMTCT). This study assessed the direct and non-direct medical costs borne by pregnant women attending PMTCT services in urban (high-HIV prevalence) and rural (low-HIV prevalence) settings, in Ethiopia. Patient-level direct medical costs and direct non-medical data were collected from HIV-positive pregnant women in six regions. The cost estimation was classified as direct medical (service fee, drugs and laboratory) and direct non-medical (food, transportation and accommodation). The mean direct medical expense per patient per year was Ethiopian birr (ETB) 746 (US$ 38) in the urban settings, as compared to ETB 368 (US$ 19) in the rural settings. On average, a pregnant woman from urban and rural catchments incurred direct non-medical costs of ETB 6,435 (US$ 327) and ETB 2,154 (US$ 110) per year, respectively. On average, non-medical costs of friend/relative/guardian were ETB 2,595 (US$ 132) and ETB 2,919 (US$ 148.39) in the urban and rural settings, respectively. Although the PMTCT service is provided free of charge, HIV-positive pregnant women and infant pairs still face a substantial amount of out-of-pocket spending due to direct medical and non-medical costs.

Keywords: Economic cost; patient cost; direct medical costs; direct non-medical costs; PMTCT service

JEL Classification: D01; D12; I14; I18

1. Introduction

HIV/AIDS continues to challenge socio-economic progress across the globe. In particular, the disease has been affecting the socio-economic development of most sub-Saharan African (SSA) countries. In the region, the disease has caused a high number of new HIV infections posing serious threats to the lives of current and future

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generations (UNAIDS, 2013). It also eroded the productive labor force in low-income countries. Especially, the epidemic has impacted on the most vulnerable sections of society, such as children and women (Foster & Williamson, 2000). Globally, almost 90% of mother-to-child transmission of HIV/AIDS was reported in African countries (Vitoria et al., 2009). The vertical transmissions of HIV/AIDS from mother-to-infant accounts for a significant proportion of the total number of new HIV infection reported in SSA countries. It is documented that 15-30% of these vertical transmissions of HIV infections from mother-to-child occur during labor, delivery, pregnancy and breastfeeding (De Cock et al., 2000; World Health Organization [WHO], 2004, 2007b). Prevailing numbers of infant infections and low antiretroviral treatment coverage for pregnant women and infants, coupled with low domestic financial resources in these countries have made it difficult to achieve zero mother-to-child HIV infections by 2015 (Joint United Nations Programme on HIV and AIDS [UNAIDS], 2013).

Part of this failure could be due to limited PMTCT services access and utilization, which in turn possibly arise from the economic out-of-pocket spending by patients while seeking PMTCT services. To date, most of the evidence on economic costs of HIV/AIDS and usage of HIV services in low-income countries has been produced at a macro level and studies have not focused on HIV-positive pregnant women. The most prominent of these macro-level analyses was conducted by the Institute of Health Metric Evaluation (IHME, 2013), which analyzed and reported on the regional and global burden of disease report, and included some disaggregated analysis for low-income countries. However, the report was not detailed enough to provide relevant evidence at the household economy level. A similar study consisted of a case study in Mozambique by Pessane and Soloman (2010), which reported on the impact of HIV/AIDS on economic growth through the erosion of human capital, an increase in absenteeism and a decline in workers' productivity.The study further found that, beyond its short-term impact, HIV/AIDS was significantly hampering the country's long-term economic growth, and led to a long-term threat to stability and development. In South Africa, a study reported on the overall impact of HIV/AIDS on the household economy, agriculture, other economic sectors and macro economy (Lori & Stover, 1999).

At a micro-level, a study in Kenya compared the out-of-pocket payments among HIV-positive and HIV-negative patients in Kenyatta National Hospital (Guinness et al., 2002) and found that there was no cost variation irrespective of a patient's HIV sero-status, suggesting that the cost factor was irrelevant to HIV status. In contrast, in the review of the literature on factors affecting HIV/AIDS service in low income countries, Souteyrand, Collard, Moatti, Grubb, and Guerma (2008) noted user fees as a critical barrier affecting antiretroviral treatment adherence. In Malawi, Pinto, van Lettow, Rachlis, Chan, and Sodhi (2013) compared patient costs differences among those who attended centralized and decentralized health facility settings.

According to Pinto et al. (2013), travel-related patients' costs were significantly different across these two groups. In Ethiopia, related studies reported qualitative, descriptive and specific-context findings on the impact of out-of-pocket spending for effective HIV/AIDS prevention, care and treatment (Biadgilign, Deribew, Amberbir, & Deribe, 2009; Bollinger, Stover, & Seyoum, 1999; Federal Ministry [FMOH], 2013; Tekola, Reniers, Haile Mariam, Araya, & Davey, 2008), but did not estimate the direct medical costs, direct non-medical costs and productivity loss of HIV-positive pregnant women attending the PMTCT services.

The economic cost of mother-to-child infection in sub-Saharan Africa can be best grasped through an understanding of the role played by women in the region. African women perform an active poverty reduction role in food crop processing, various levels of household chores, food storage and transportation, hoeing and weeding. Given women's contribution to the economy of the households, the burden of HIV/AIDS on the HIV-positive pregnant women (attending their antiretroviral treatment) is likely to result in severe economic losses. However, little evidence exists from the perspective of HIV-positive pregnant women attending their lifelong antiretroviral treatment. In particular, this evidence is pertinent in light of the recent changing international PMTCT treatment protocol (WHO, 2007a, 2012). For instance, the recent PMTCT service protocol for the option B+ treatment regimen requires more frequent visits and consultations, and could probably cause excess out-of-pocket spending for transportation, food and accommodation for HIV-positive pregnant women. In addition, these high medical expenses could in turn hamper effective utilization of PMTCT services, in particular for poor pregnant women from the rural country-side.

The deficiency of evidence is particularly high in Ethiopia as no study has specifically analyzed the economic impact of HIV/AIDS at patient and household levels in the context of the PMTCT, as well as from heterogeneous HIV-prevalence and socio-economic (urban-rural) settings. Studies reporting the impact of HIV/AIDS in Ethiopia were conducted by Tekola et al. (2008) and Kloos and Mariam (2000), and reported the socio-economic burden of HIV/AIDS in specific parts of the country. Another study highlighted the broader economic impact of the disease on the households, agriculture, firms, other economic sectors and the macro economy (Bollinger et al., 1999). None of these studies analyzed the patient's perspective on costing among HIV-positive pregnant women attending their lifelong antiretroviral treatment. To fill this gap, this study aimed to analyze the direct medical and direct non-medical costs among HIV-positive pregnant women attending health facilities in Ethiopia, and comparing the costs across urban-rural settings.

2. Methods

2.1 Data collection

Patient cost data were collected from 85 HIV-positive pregnant women attending their antiretroviral treatment, 17 Mother Support Groups (MSGs) and 12 healthcare professionals who were closely working with the patients. The patients attending their life-long antiretroviral treatment were recruited from the twelve health facilities (six urban high HIV-prevalence and six rural low HIV-prevalence facilities) across six regions in Ethiopia. Heterogeneity in HIV prevalence and urban-rural location were used as criteria to select twelve health facilities from the 2012 antenatal-based sentinel surveillance sites (Ethiopian Public Health Institute [EPHI], 2014). The survey was conducted from Aug 17 to Oct 2, 2015. The surveyed health facilitates are located in six regions of Ethiopia: Oromia, Amhara, South Nations and Nationality of People (SNNP), Harari, Addis Ababa and Dire Dawa. In accordance with the 2012 antenatal-based sentinel HIV surveillance data (EPHI, 2014), patients were recruited from six urban health facilities (Bahir Dar Hospital, Hiwot Fana Hospital, Dile Chora Hospital, Armed Forces Referral and Teaching Hospital (AFRTH), Soddo Health Center and Teklehaimanot Health Center), which had the highest HIV prevalence (8.8 to 17.3) across the country. Other groups of patients were interviewed from the rural and low-HIV prevalence health facilities (0.0 to 0.1), namely, Limuseka Health Center, Daddim Health Center, Toke Health Center, Chewaka Health Center, Kokosa Health Center and Hasange Health Center.

As shown in Figure 1, patient perspective costing was analyzed and categorized into direct medical costs and direct non-medical costs. Direct medical costs included the direct expenses incurred by HIV-positive pregnant women while attending their antiretroviral treatment services such as: HIV counseling and testing, hospital admission, antiretroviral option B+ treatment follow-up and early infant diagnosis (EID) services. The analysis also considered the cost incurred by guardian/relatives/friends during the patient consultation visits. The second costing category was direct non-medical costs, which covered the cost of purchasing non-medical supplies/equipment, which were not typically linked with the diagnosis or treatment. This comprised costing items such as: transportation, food and accommodation costs incurred by patients; and transportation, food and accommodation costs incurred by caregivers/friends/guardians.

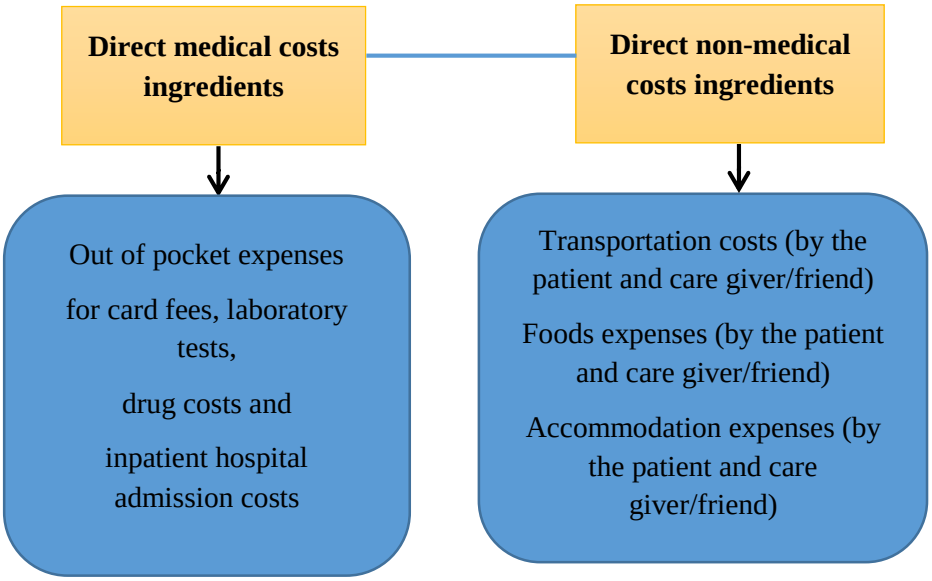

Figure 1. Patient costing framework for direct medical costs and direct non-medical costs

The economic and financial costs attributed to HIV morbidity incurred by HIV-infected mothers and their households were analyzed through a retrospective bottom-up diagnostic-specific method (Akobundu, Ju, Blatt, & Mullins, 2006; Tarricone, 2006). Patients attending the surveyed health facilities were requested to provide all the costing ingredients paid (during outpatient consultation and inpatient admission) retrospectively. Applying the bottom-up retrospective approach, the patient-level costing was conducted to estimate direct medical and direct non-medical costs paid by guardian/relatives/friends. The national-level patient perspective costs were estimated considering the final cost summary measure (per patient per year [PPY]) and country wide estimated number of HIV-positive pregnant women who were in need of treatment in urban and rural settings (Ethiopian Health and Nutrition Research Institute [EHNRI], 2012). A sensitivity analysis was conducted to estimate the national-patient cost using three scenarios: at the 57% current coverage level, at the 75% coverage level, and at 100% coverage level. The data were first entered using EpiData 3.1 software and transferred for analysis to the Statistical Package for the Social Sciences (SPSS) software version 22. Relevant statistical tests, t-tests (equal or non-equal variance assumptions) and Pearson chi-square tests were applied to compare results across urban-rural settings.

The patients' costing tool was adopted from the KNCV tuberculosis foundation, WHO and Japan's anti-tuberculosis association (Tuberclusosis Coalition for Techncial Assistance [TBCTA], 2007). It was piloted in two health facilities (Gandhi Memorial Hospital and Beletsheachew Health Center) in Addis Ababa. The tool comprised different sections: patient information, diagnostic costs, total time spent for HIV counseling and testing, treatment, care and support, costs related to the follow-up tests, guardian costs, hospitalization costs, food supplements, coping costs and productivity loss attributed to the HIV/AIDS illness. A supplementary interview guide was prepared to interview MSGs and health care professionals. National-level patient data were extracted from the Federal Ministry of Health (FMOH)/ Ethiopian Public Health Institute (EPHI) data base (EPHI, 2014), and further checked using the Health Management Information System (HMIS) database in six regional health bureaus (Oromia, Amhara, SNNP, Harari, Addis Ababa and Dire Dawa).

2.2 Ethical Consideration

The research project was approved by the University of KwaZulu-Natal (UKZN) Biomedical Research and Ethics Committee (BREC REF: BE385/14) and the Federal Ministry of Health/ Ethiopian Public Health Institute Scientific and Ethical Review Office (SERO REF: 6.13/80). An official letter of permission was obtained from the Federal Ministry of Health (FMOH) and Ethiopian Public Health Institute (EPHI) to the respective selected regional health bureaus and surveyed health facilities. An informed consent form was obtained from the HIV-positive pregnant women, Mother Support Groups and health professionals, before starting the data collection.

3. Results and Discussion

A total of 85 HIV-positive pregnant women were interviewed. As a way of exhausting all costs information (outpatient and inpatient) from women attending PMTCT services, additional costing inputs to be included in the costing sheets were solicited from 17 MSGs and 12 healthcare professionals who were closely working with the patients. Of all the HIV-positive pregnant women respondents interviewed in rural and urban facilities, the majority (66%) were from urban high-prevalence settings.

3.1 Socio-demographic Characteristics

Table 1 describes the socio-demographic characteristics of the respondents, notably age, educational status, occupation, marital status and household income earnings. The mean age of the respondents was 29 and 28, in urban and rural settings, respectively. Of the respondents from rural low-HIV settings, 62% were illiterate, while 43% had attained primary education in the urban high-HIV prevalence

settings. The data showed a statistical difference in the education status across urban-rural settings ($p < 0.001$). In the urban settings, 68% of urban high-HIV prevalence respondents were permanently paid employees or had a trade/ business occupation, while 59% of the rural study participants were farmers, and engaged in various small-scale business activities (not shown in Table 1). A statistical difference was reported in the type of occupation among the urban-rural respondents ($p < 0.001$). Married patients comprised 66% in urban settings, and 34% in rural settings. Of all single participants, 100% were from urban settings against 0% in rural settings. The corresponding numbers of married and divorced people were 66% against 34%, 57% against 43%, respectively.

A relatively higher proportion of the household income earners (across different categories), were reported in urban settings, as compared to the rural respondents. However, there was no statistical difference reported between the study participants across the urban and rural settings, respectively. Of the listed groups of the primary income earners, father/husband had a primary income role for 70% of respondents in urban settings and 30% in rural settings. The woman/wife was the primary income earner for 55% and 45% in urban and rural contexts, respectively. Most respondents had a monthly income of Ethiopian birr (ETB) 500 (United States dollar (USD) 25.42) [1] and above in the urban settings, while the majority of rural respondents earned below ETB 500 (USD 25.42). Urban patients' earned a relatively higher proportion of the household income as compared to those in the rural settings (Chi-square, $p < 0.001$). This may be linked with the continuous low economic empowerment and primary income role played by women in rural settings, as compared to the educated, empowered women who are living in the commercial urban cities.

Table 1. Socio-demographic characteristics of the respondents in urban and rural settings

Socio-demographic variables	Urban high-HIV prevalence settings	Rural low-HIV	P-value
N	n= 56	n=29	
Age	29.39 (SD: 5.38)	28.07 (SD: 7.89)	0.085
Educational status			0.000†
Illiterate	5 (22%)	18 (78%)	
Basic Education	10 (83%)	2 (17%)	
Primary (grade 1-8)	24 (77%)	7 (23%)	
Secondary (grade 9-10)	9 (90%)	1 (10%)	
Preparatory (11-12)	3 (100%)	0 (0%)	
10+TVET	1 (100%)	0 (0%)	
College/university	4 (80%)	1(20%)	

[1] Prices are reported in 2014 Ethiopian birr (ETB) and converted to United States Dollar (USD) at the weighted exchange rate (1 US$ = 19.6705 ETB) from www.oanda.com, retrieved on 05 Nov 2015.

Occupation			
Farming	2 (15%)	11 (85%)	0.000†
Wage labor	6 (60%)	4 (40%)	
Permanent paid employee	18 (100%)	0 (0%)	
Trade/business	20 (77%)	6 (23%)	
Student	2 (100%)	0 (0%)	
Housewife	1 (25%)	3 (75%)	
No occupation	7 (58%)	5 (42%)	
Marital status			
Single	4 (100%)	0 (0%)	0.346
Married	47 (66%)	24 (34%)	
Divorced	4 (57%)	3 (43%)	
Widowed	1 (50%)	1 (50%)	
Live with partner	0 (0%)	1 (100%)	
Household income earner			0.634
Patient	6 (55%)	5 (45 %)	
Wife/Mother	6 (55 %)	5 (45 %)	
Husband/ Father	42 (70 %)	18 (30 %)	
Extended family	2 (67 %)	1 (33 %)	
Household income (per month)			0.000†
Under 500 ETB per month	6 (30 %)	14 (70 %)	
500 ETB to 750 ETB per month	10 (56 %)	8 (44 %)	
750 ETB to 1000 ETB per month	4 (57 %)	3 (43 %)	
More than 1000 ETB per month	23 (100 %)	0 (0 %)	
Don't earn	13 (76 %)	4 (24 %)	

NB. Because of the decimal rounding, the total does not sum up to 100%.
† = Significant at $p < 0.001$

A total of 131 respondents were recruited for the cost-of-illness questionnaires from three different groups: HIV-positive pregnant women attending the health facilities (n=85), MSG members (n=34) and health care workers (n=12). This was due to low PMTCT attendance by HIV-positive pregnant women in surveyed health facilities. According to the previously conducted surveys by the FMOH and UNAIDS (FMOH, 2012, 2014, 2015; UNAIDS, 2013), a low service uptake exists among the expected HIV-positive pregnant women across the country. For instance, in 2011/12, of the targeted HIV-positive pregnant women only 25.5% accessed and accepted the service (FMOH, 2012). In particular, two interview sessions (with MSGs and health care workers) were considered to substantiate whether or not any patients' cost data were missed or ignored during interview sessions with HIV-positive pregnant women (option B+ regimen) respondents. In addition, the interview sessions with MSGs and health workers were used to gain more insight into the relevant patient costing ingredients to include in the questionnaire to be given to the pregnant women and to use in the datasheet.

3.2 Direct Medical Costs

An HIV-positive pregnant woman-infant attending lifelong antiretroviral treatment (ART) incurred direct medical costs of ETB 746.00 (US$ 37.92) per year in urban high HIV-prevalence settings and ETB 368.40 (US$ 18.73) per year in rural low HIV-prevalence areas. The urban direct medical spending per pregnant women cost twice the amount spent in the rural settings. Of the listed direct medical cost categories, antibiotic drug costs, health facility sheets (patient admission), drugs costs during inpatient admission and laboratory test costs (during patient admission) were significantly higher in urban settings, relative to the rural settings ($p < 0.05$). However, there was no statistical significance between urban-rural respondents for the direct medical costing ingredients notably: HIV counseling and testing fees (card fee/consultative), health facility administration fees (for the admitted patients), other co-infections tests (including TB) costs and other co-infections drugs.

The detailed list of direct medical cost findings is described in Table 2. Similarly, a study by Pearson, Gandhi, Admasu, and Keyes (2011) indicated that, although service utilization was at a low level in Ethiopia, pregnant women still incurred costs for drugs and supplies. The study further finds that 65% of the surveyed health facilities in Ethiopia still charge user fees for maternity services. In South Africa, similar findings were reported on the additional cost of purchasing non-prescriptive drugs and food for 60% of patients on ART (Rosen, Ketlhapile, Sanne, and DeSilva (2007), while high costs of medical HIV/AIDS services affecting the household economy were reported in Kenya (Guinness. et al., 2002).

Table 2. Direct medical costs per patient per year in urban-rural settings

Direct Medical Cost Variables	Settings	Mean (ETB)	Std. Deviation	Std. Error Mean	F	Sig.	t	df
HIV counseling & testing fees (card fee, consultative)	Urban settings	1.18	6.74	0.90	0.07	0.79	-0.02	83.00
	Rural settings	1.21	2.18	0.40			-0.03	73.54
Antibiotic drug costs (relevant for ART treatment and to treat other-co-infections)	Urban settings	29.11	73.05	9.76	21.92	0.00†	2.14	83.00
	Rural settings	0.00	0.00	0.00			2.98	55.00
Health facility administration fees (for the admitted patients)	Urban settings	48.97	134.39	23.05	0.35	0.56	-1.21	49.00
	Rural settings	92.06	84.00	20.37			-1.40	46.35

Health facility Sheets/Linnen fees (for the admitted patients)	Urban settings	132.06	116.80	20.03	13.54	0.00†	3.75	50.00
	Rural settings	22.78	54.64	12.88			4.59	49.50
Drugs cost (during the inpatient admission)	Urban settings	249.45	252.59	45.37	10.09	0.00†	2.24	45.00
	Rural settings	104.00	77.33	19.33			2.95	39.29
Tests cost (during the inpatient admission)	Urban settings	67.03	87.99	15.80	4.40	0.04††	0.70	44.00
	Rural settings	50.07	47.91	12.37			0.85	43.24
Other co-infections tests costs	Urban settings	74.25	213.73	47.79	2.53	0.12	0.70	30.00
	Rural settings	30.42	45.10	13.02			0.88	21.72
Other co-infection drugs costs	Urban settings	53.25	199.96	44.71	1.80	0.19	0.75	30.00
	Rural settings	9.58	19.36	5.59			0.97	19.59
Fees (related with the follow up tests)	Urban settings	13.80	33.39	6.68	2.17	0.15	0.06	41.00
	Rural settings	13.33	14.75	3.48			0.06	35.13
Total direct medical costs per pregnant women-infant pair	Urban settings	746.00	749.68	207.92	1.77	0.20	1.10	16.00
	Rural settings	368.40	161.91	72.41			1.72	14.45

† Statistical significance at $P < 0.001$

††Statistical significance at $P < 0.05$

3.3 Direct Non-medical Costs

The mean transportation cost per pregnant women per year was ETB 1,276.07 (US$ 64.87) and ETB 636.67 (US$ 32.37) in urban and rural settings, respectively. The transportation cost by patient in the urban settings was double compared to the one in the rural settings. This may be related to the fact that urban HIV-positive pregnant women pay more for available transportation to the health facilities than do rural respondents who are more likely to have to walk to reach the facilities. Of the different transportation-linked activities, travel costs due to other co-infectious diseases and ART treatment follow-up activities contributed the lion's share in both the urban and rural settings. These findings line up with the evidence in Malawi where travel expense was the major contributor to patient costs to access HIV/AIDS care services (Pinto et al., 2013).

As for the transportation cost paid by patients, the travel expenses paid by the friends/guardians/partners were high. Friends/guardians/partners spent the means cost of ETB 1,783.73 (US$ 90.68) and ETB 2,066.44 (US$ 105.05) in urban and rural settings, respectively. A relatively higher travel cost was incurred in rural as compared to the urban settings. This may be related to more solidarity and companionship in the rural countryside, as compared to in the urban settings. Of the listed transportation cost breakdown, friends/guardians/partners spent more than 85% of the cost proportion, in both the urban and rural settings, during the inpatient health facility admission. This was due to a significantly higher frequency of visits in rural settings (Mean = 20), as compared to the rural settings (Mean=14) ($p < 0.05$). Moreover, there was also a significant cost variation estimated on the transportation costs paid by relatives in urban-rural settings, during the inpatient admission.

With respect to food expenditure, an average pregnant women per year (attending option B+ treatment regimen) from the urban settings spent ETB 4,700.50 (US$ 238.96) for food items in the urban settings, while it was ETB 1,510.83 (US$ 76.81) in the rural settings. Food cost (per PPY) in a household (attributed to HIV illness) in the urban settings was more than twice the expense estimated in the rural settings ($p < 0.05$). This may be explained by the increased awareness of the HIV-positive population of the need for a nutritionally balanced diet in the urban settings, and relatively higher household income. Moreover, there was also a statistical variation reported on food expenses (during ART initiation and counseling), food costs (during the CD4 blood sample testing service), food costs (during the monthly ART drug refilling and counseling) and food costs (during linking the patient to care and support services).

Friends/relatives/guardians spent non-medical costs on food items for accompanying the HIV-positive pregnant women, starting from HIV/AIDS counseling and testing to the antiretroviral treatment follow-up. These costs included food expenses during the HIV/AIDS counseling and testing, during the CD4 count blood sample service, during the early infant diagnosis/ dry blood testing, during ART initiation and follow-up, and during the inpatient admission. The mean cost of food by friends/relatives/guardians was ETB 811.29 (US$ 41.24) (SD = 403.72) and ETB 832.78 (US$ 42.34) (SD = 783.64) in urban and rural settings, respectively. The mean food expense of ETB 253.36 (US$ 12.88) was estimated per patient per year (during ART initiation, drug refilling and follow-up) in the urban settings as compared to ETB 140.74 (US$ 7.15) expenses in the rural settings ($p < 0.001$). During the inpatient hospital admission, the mean food cost by relatives was ETB 670.88 (US$ 34.11) in the rural areas, as compared to ETB 482.06 (US$ 24.51) in the urban areas.

The mean accommodation expense per patient per year was ETB 458.54 (US$ 23.31) in urban settings, as compared to ETB 6.90 (US$ 0.35) in rural settings ($p < 0.001$). Of all the accommodation costing categories in the urban settings, the

accommodation expense by patients (during the monthly ART drug refilling and counseling) accounts for the highest proportion of costs. This was due to the frequent monthly visit (including hospital admissions) by the patients for drug refilling, treatment and counseling services. As compared to the urban settings, patients from the rural areas did not incur any accommodation expense during ART initiation and counseling, during the Early Infant Diagnosis (EID) testing, during the monthly ART drug refilling and counseling and while linking care and support services. The cost variation reported in the urban and rural settings was possibly related to the relatively higher hospital admission fees, as compared to the insignificant (or almost free of charge) costs in the remote rural health facilities.

Unlike the expense for food and transportation, friends/relatives/guardians incurred a significantly lower proportion of the cost for accommodation expenses, both in the urban and rural settings. The mean accommodation cost (by friends/guardians/partners) per PPY was ETB 19.67 (US$ 1.01) in rural settings, as compared to ETB 0.00 (US$ 0.0) in the urban settings ($p < 0.001$). None of the respondents indicated the accommodation-related expense during the patient's outpatient consultation for HIV/AIDS counseling and testing, the CD4 count service, EID service, and ART initiation, drug refilling and follow-up. Most of these activities were conducted during the daily consultation visits, without incurring additional accommodation-related expenses by the third parties. Notably, a higher accommodation cost was estimated in the rural settings, as compared to the urban settings. This was probably due to higher solidarity from friends/guardians/partners and closer companionship during the inpatient admission in the rural settings, as compared to the urban.

3.4 Summary Cost Estimate

Table 3 indicates the direct medical and direct non-medical cost estimate per HIV-positive pregnant women per year. Analyzed from within each setting, food cost was the cost driver in the urban settings, while transportation cost (by friends/relatives/guardians) was the main contributor in rural settings. Of the listed non-medical cost items, food costs and transport costs were the main cost contributor in both the urban and rural settings. As compared to patients, friends/relatives/guardians spent the highest proportion of expenses for transportation in both settings. This was probably due to the higher frequency of friends/relatives/guardians visits and companionship. The detailed unit cost evidences in Table 3 provides good evidence for budget planning and cost efficiency. Similarly, in this respect, also highlighted that cost-of-illness evidence significant role in resource allocation, priority setting (Rice, 2000) and budget management (Rice, 1994). For instance, Tarricone (2006) highlighted its relevance in terms of estimating the amount of resource consumption, cost identification, cost containment, clinical illness management and cost variability.

Table 3. Summary cost estimate for direct medical and direct non-medical per patient per year

Cost per patient per year	Urban Mean (SD)	Rural Mean (SD)
Direct medical cost	746.00 (749.68)	368.4 (161.91)
Direct non-medical costs		
Transport cost (paid by the patient)	1,276.07 (3,099.38)	636.67 (349.31)
Transport cost (paid by friends/ relatives/guardians)	1,783.73 (1,470.39)	2,066.44 (2,193.88)
Food costs (paid by the patient)	4,700.5 (4,226.35)	1,510.83 (376.18)
Food costs (paid by friends/relatives/guardians)	811.29 (403.72)	832.78 (783.64)
Accommodation expense (paid by the patient)	458.54 (1,157.1)	6.9 (37.14)
Accommodation expense (paid by friends/ relatives/ guardians)	0.0 (0.0)	19.67 (44.5)
Total cost per patient per year	9,776.13 (US$ 496.99)	5,441.7 (US$ 276.6)

SD = standard deviation

3.5 National Cost Estimate

Nationally, in 2014, at the current coverage and program uptake level, the estimated patient level cost was US$ 7,756,763.7 in urban settings, while it was US$ 2,730,825 in rural areas. As shown in Figure 2, the estimated national patient cost increased with an increase in service coverage. In other words, when more HIV-positive pregnant women access the service, the estimated national patient-level cost for direct medical and non-medical costs increased. However, during the period 2011 to 2016, there was an estimated decline in the number of HIV-positive pregnant women due to a lower HIV incidence (EPHI, 2014). As a result of the estimated decline in HIV prevalence, the national patient spending (for direct medical costs and direct non-medical costs) declined over time. Understanding the national perspective patient-level costs (in Figure 2) is important to highlight the overall economic burden on the society. There is already some evidence in Ethiopia that this information is needed as a number of studies (by Biadgilign et al., 2009; Pearson et al., 2011; Tekola et al., 2008; Ghailan et al., 2010)) have alluded to the consequences of the high costs of using HIV/AIDS services in the country.

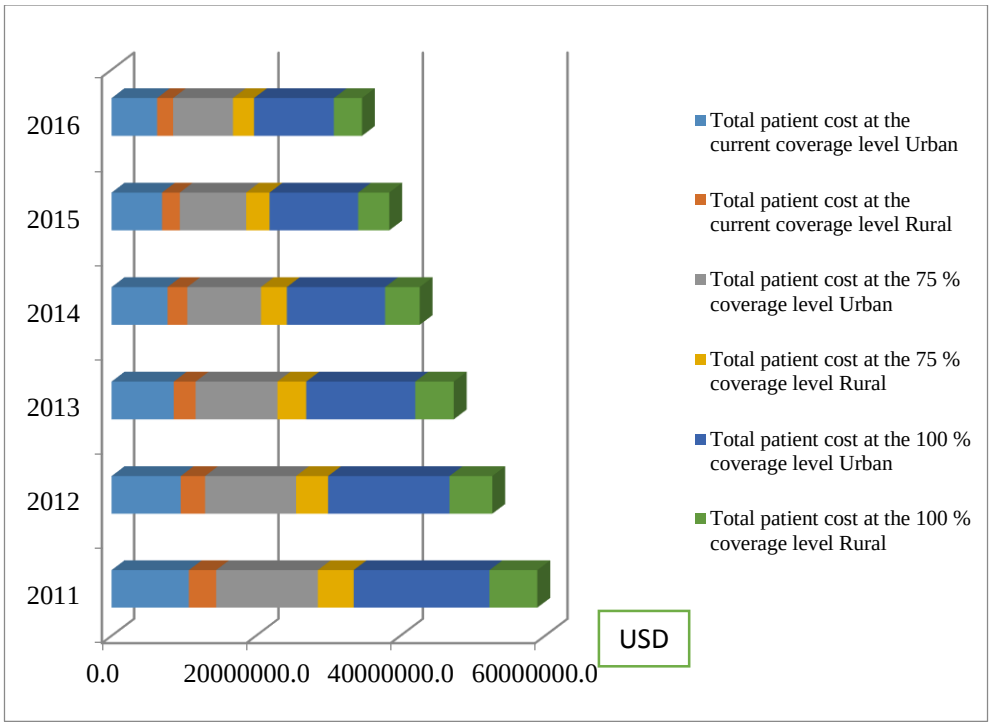

Figure 2. National patient perspective cost in urban and rural settings, 2011- 2016

4. Conclusion and Recommendation

Although the HIV/AIDS care services are provided free of charge in Ethiopia, patients incurred substantial direct medical and direct non-medical costs, which probably affects the intended public health outcome for the HIV-positive pregnant women and pediatrics attending antiretroviral lifelong treatment. According to our analysis, an average pregnant woman (per year) attending the surveyed health facilities estimated to incur ETB 9,776.13 (US$ 496.99) and 5,441.7 (US$ 276.6) cost due to direct medical costs and direct non-medical costs, in urban and rural settings, respectively. Of these costs, transportation and food expenses were the main cost drivers, in both the urban and rural settings. In addition, the significance patient-level cost differences across urban and rural settings also provide policy makers with important information on costs planning, priority-setting, budgeting, resource allocation and distribution. The evidences in this study is crucial for Ethiopian health sector policy makers and program implementers seeking to improve access to PMTCT services, as well as on the current effort towards universal health coverage (UHC).

The study reports also a significant extra cost to friends/guardians/relatives while visiting the admitted patients or accompanying them to outpatient PMTCT treatment follow-up services. The estimated transportation costs paid by friends/guardians/relatives was ranged from ETB 1,783.73 (US $90.68) and 2,066.44 (US$ 105.05) in urban and rural settings, respectively. In addition, the mean costs for food was ETB 811.29 (US$ 41.24) and ETB 832.78 (US$ 42.34) in urban and rural settings, respectively. Adding to the non-medical costs the direct costs per patient per year of ETB 746 (US$ 37.92) in the urban settings, and ETB 368.4 (US$ 18.72) in the rural settings, increases even further the burden of HIV suffered by pregnant women and the household. Projecting its impact at the current national PMTCT coverage level, the patient level costs ranged from US$ 2,730,825 to US$ 7,756,763.7 in rural and rural settings, respectively.

It is finally worthwhile to acknowledge the limitation of this study. Due to the low PMTCT service uptake at the surveyed health facilities, this analysis depended on a limited sample size (85 HIV-positive pregnant women, 17 MSGs and 12 health care professionals). The sample makes it difficult to generalize the findings to the general population. The unit cost per pregnant women-infant pairs was used to estimate the national-patient perspective cost associated with mother-to-child HIV infection. However, this projection may be improved applying adequate and nationally representative sample size. A related shortcoming is that the study targeted HIV-positive pregnant women accessing PMTCT services and did not include those who had not started or had defaulted on using the treatment. These limitations should be well taken into consideration along the study findings and interpretation.

Despite these shortcomings, we believe that the findings are instrumental in highlighting the patient perspective costs resulting from HIV/AIDS transmission from mother-to-child in urban and rural settings. The analysis reported the direct medical and direct non-medical costs across the different contexts (urban high-HIV prevalence versus rural low-HIV prevalence), which could potentially inform the current country strategy towards the elimination of new mother-to-child HIV infections and current universal health coverage agenda. Finally the finding from this study is also crucial to provide relevant economic input evidence for further cost effectiveness analysis studies, considering the societal perspective.

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