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Patient Cost of Accessing Anti-retro Viral Therapy at Public Health Facilities in Zambia

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Abstract

Objective: *To quantify and compare the cost incurred by patients when accessing anti-retro viral treatment from urban and rural public health facilities in Lusaka (urban) and Chongwe (rural) districts of Zambia.*

Methods: *We used cross sectional data collected from 476 ART clients in a facility based survey undertaken in 2016 at four health facilities in Zambia. Arithmetic monetary and non- monetary costs were computed for each locality. A multivariate log it model was used to identify characteristics which predisposed clients to higher costs than average.*

Results: *Patients who reside in urban areas had higher average costs of accessing treatment than those in rural areas. There was a 13 percent difference in costs between the two localities though when compared to average rural and urban national income levels, patients in rural area spent a higher proportion of their income on ART related costs (13 percent) than those in urban areas (4 percent). The biggest contributor to costs faced by patients was the cost of procuring supplementary foods to ensure sufficient nutrition intake. We found that education and income were significant characteristics that affected the likelihood of having higher costs.*

Conclusion: *There is need to focus on both the cost of providing HIV treatment as well as accessing it. The provision of food supplementation to vulnerable clients, especially in rural areas, may be key to the promotion of treatment adherence.*

Keywords: *HIV/AIDS, patient cost, Antiretroviral Therapy, Zambia*

Abbreviations: ***AIDS****: Acquired immune deficiency syndrome;* ***ART****: Antiretroviral therapy;* ***ARV****: Anti-retroviral;* ***HIV****: Human Immune deficiency Virus.*

1. INTRODUCTION

Significant progress has been made in the global fight against Human Immuno deficiency Virus (HIV) due to the rapid scale-up of the provision of free antiretroviral therapy (ART). In Zambia, provision of free ART by the Ministry of Health began in 2005, leveraging support from the Global Fund to Fight AIDS, Tuberculosis and Malaria, the United States President's Emergency Plan for AIDS Relief and other partners. Since the introduction of free ART, significant amounts of resources have been invested in scaling up of prevention, treatment, care and support HIV services [3]. In this paper, we examine the monetary and time costs incurred by patients as they access the freely available ARTs and identify factors which predispose individuals to facing higher costs than the average faced by others.

The estimation of ART client cost of accessing treatment is important in comprehensively evaluating expenses incurred whilst on treatment. Estimation of such costs can further strengthen social protection services for people with HIV and ensure sustained uninterrupted access to ART. This will enable patients to adhere to treatment and avoid them developing resistance due to non-adherence which could result in changing ARV regiments from first to second or third-line regiments which are more expensive to provide. The study is especially relevant given the relatively high HIV prevalence rate in Zambia. The national adult HIV prevalence in Zambia amongst those aged 15 to 49 years reduced from 13.3 percent in 2014 to 11.1 percent in 2018 [3, 22]. Though a reduction, this is almost three times the Sub-Saharan Africa average prevalence rate which was 3.9 percent in 2018 and also significantly higher than the prevalence rate amongst least developed countries (1.78 %) [21].

In 2007, it was estimated that only between 50 percent and 66 percent of those in need of ART in Zambia were accessing it and while some of those who are not in care have deliberately optednotto see kit, others lack there sources,

information or motivation required to do so [17,18]. By the end of 2015, about 67% of women and 56% of men living with HIV were receiving ART representing 63% ART coverage [19]. Understanding why patients opt out of care, or are unable to opt in, is important to achieving the goal of universal access.

Various studies, to which this study is related to, have estimated adherence levels in resource-constrained settings similar to Zambia. Almost all of these have found poverty related structural barriers to accessing ART [14, 6, 4, 9, 13, 1]. In Malawi, research undertaken in 2013 identified transport costs as the main barrier to initial uptake of ART as well as adherence Pinto et al. [13]. This is similar to the findings of a similar multi-country study undertaken in Uganda, Tanzania and Malawi to understand patient costs [6]. A study undertaken in SouthAfrica which estimated the costs that South African patients incur in obtaining ART also recommended that patient costs should be considered in efforts to sustain adherence and expand access to ART [14]. A 2010 study undertaken on barriers to ART access in Zambia found that perceived financial and logistical barriers (namely costs of food, transportation and care) affected the decision by HIV/AIDS patients who had never initiated ART and recommended that efforts to expand access to antiretroviral care should consider ways to reduce these barriers in order to encourage more of those medically eligible for anti retroviral to initiate care [5]. However, the study did not quantify the perceived costs faced by patients accessing ART care. Hjortsberg and Mwikisa [7] examined equality of access to healthcare among Zambians and found that there were significant inequalities among residential areas, especially between the rural and urban areas and the root cause was the difference in distances to the nearest facility, which translated to higher costs for those further away. In view of the evidence that cost is an important barrier to accessing medical care and to ART uptake and adherence, we quantify direct patient costs associated with ART in Zambia and identify factors which increase the probability of individuals having higher costs than other clients.

The rest of the paper is organized as follows: Section 2 provides a situational analysis of antiretroviral therapy in Zambia while section3 sets out the methodology. Section4 presents the results from the analysis while section 5 provides a discussion of the results and concludes.

2. Access to Antiretroviral Therapy in Zambia

With an estimated population of 17 million people, Zambia had around 51,000 new HIV infections and 17 000 AIDS-related deaths in 2019 [23, 20]. The number of all people living with HIV was estimated to be around 1.2 million [20]. A 2016 population-based survey revealed an annual incidence of HIV among adults ages 15 to 59 years of 0.66 percent (1.0 % among females and 0.33 % among males), corresponding to about 46,000 new annual HIV cases among adults in this age group in Zambia [10]. Although there are geographical differences across the country, national prevalence of HIV among adults aged 15 to 59 years in Zambia is 11.1 percent (14.2 % among females and 7.5 % among males) [10].

The Government of Zambia has taken important and progressive steps to increase access to ART, including making ART and associated laboratory tests free of charge. The country has seen a rapid Scale-up of HIV interventions since the first case of AIDS was reported in 1984. For example, the number of health centers providing ART increased from 156 in 2006 to 322 in 2007 [12]. In 2007, 149 199 clients, accounting for 50.5 percent of all those in need, were registered and receiving ART [11]. By 2019, the number of people receiving ART was about 1.1million country wide, representing HIV coverage of around 85percent [20]. About 65 percent of all adults and 52 percent of all children below the age of 15 years with HIV are on life saving anti retroviral treatment (ART). In 2016, prevalence of viral load suppression among HIV-positive adults ages 15 to 59 years in Zambia stood at 59.8 percent (61.3 % among females and 57.5 % males)[10].

The rapid scale-up of HIV services was spurred by increased external funding for AIDS control and Zambia's commitment to provide free antiretroviral treatment for all people with HIV. With the recent policy changes to provide treatment to all people with HIV regardless of their viral load, the number of people expected to be on treatment is likely to increase. Inorder to ensure sustainability of treatment and its positive out comes, it is important to have accurate estimates of costs for provision of treatment as well as accessing treatment. Although ART, including laboratory tests can be accessed without charge, people on ART in Zambia incur costs related to nutritious food, transportation to health facilities and time-

related costs.

While studies have been done to estimate the cost of providing ART, few studies have documented what it costs a patient to access treatment, especially in settings where ART is provided without charge in public health care facilities (see for example [15, 16, 6, 1]). Our contribution to the literature will therefore be an estimation of the patient cost of accessing ART in public facilities in Zambia and the identification of factors that predispose individuals to having higher costs than others.

3. Materials and Methods

3.1. Study Sites

The study uses primary data collected by a team of researchers from the University of Zambia from four public health facilities in Lusaka Province. Two of these facilities were in Lusaka district (urban) while the other two were rural facilities based in Chong we district. The study sites were purposely selected based on the high volume of ART clients and are Level1 primary health centers.

3.2. Data Collection

Data was collected from a total of 476 ART clients in October 2016. The data was collected through one-on-one interviews and the respondents were systematically selected from a register of ART clients visiting at the health facilities on the particular day over a period of two weeks in each district. The study population consisted of ART clients aged over 18 years at the time of the survey. The main purpose of the survey was to collect individual level data which quantified self-reported expenditure as incurred by patients as they accessed ART in order to provide policy recommendations on how client costs can be mitigated. A semi-structured questionnaire was developed and used to collect data. Only quantitative data was collected and the key variables were: travel times and costs to and from the health facilities, opportunity costs in the form of lost wages from being absent from work, costs associated with health-related purchases (supplementary food recommended for people on ART), and costs associated with the hiring of extra help for household chores.

3.3. Statistical Analysis

To calculate the patient unit cost of accessing ART, we adapted the methodology used by Hjortsberg and Mwikisa [7] to calculate the cost of accessing health facilities. In this regard, we calculated both the time and monetary costs of visiting the facilities. In addition to this, we also calculated the cost of supplementary foodstuff consumed as a result of being on treatment and the cost of extra household help. The total cost TC_i is calculated as follows:

$$TC_i = \sum_{i=1}^{n} x_{ij} + \sum_{i=1}^{n} y_i \quad (1)$$

Where x_{ij} is a vector of direct monetary costs to the client and is computed by summing thecosts of supplementary food and travel to the clinic. Similarly$y_i$represents a wage estimate in terms of foregone income that results from the time spent going to the clinic for the treatment. Due to the small number of respondents who reported needing extra household help resulting from their HIV status (less than 4 % of respondents), this variable was omitted from the analysis but the costs are discussed in the results section.[1]

A binary variables was derived from the total median and mean cost obtained, coded as 1 if the patient cost were lower and 0 otherwise, and used as the dependent variable in a logistic regression model to identify patient characteristics that increased the likelihood of having higher costs. The independent variables included the regression we relocality (rural versus urban), education level (measured as years of schooling), marital status, age, sex, income, the number of years on treatment and employment status. We used robust standard errors which correct for potential heteroscedasticity in the models. Marginal effects were obtained to further illustrate the partial effects of a unit increase in the explanatory variables on the conditional mean of the dependent variable.

3.4. Ethics

Ethical clearance was obtained from a local nationally accredited ethical review board based in Zambia, Eres Converge, before the field work was conducted. Further approval was sought from the Ministry of Health, the Lusaka District Board of Health, and from the facility in charge at the four health facilities. Information sheets were provided to and informed consent obtained from all participants who were all aged over the age of 18. The tools were translated and administered in the local language for those who could not speak English.

[1]The full table of results including cost of extra help is available from the authors on request.

4. RESULTS

4.1. Description of the Study Participants

This section presents descriptive statistics of the study participants. Urban participants made up 62.39 percent of the sample while 37.61 percent were from the rural facility. Overall the sample was made up of more females at 66.81 percent and the average age of the respondents was 38 years. This sample distribution is consistent with the national distribution of the epidemic with 18.2 percent of HIV infections reported in urban areas compared to 9.1 percent in rural areas and 16.1 percent of HIV infections are among females compared to 12.3 percent males aged 15 to 49 years [3]. In terms of employment, up to 89.33 percent reported being in some kind of employment in the rural areas (mainly agricultural) while it was lower in the urban areas at 79 percent. Types of employment included formal, informal, self-employed and agricultural employees. Generally, agriculture sector employment was higher in the rural area with 26.7 percent reporting that they were employed in the sector compared to 12 percent in the urban site. Formal employment was higher in the urban area (27.65%) than the rural area (17.61%). However, reported unemployment[2] was twice as high in the urban area (20.82 %) than the rural area (10.23%).

In terms of education attainment, only 8.82 percent of the respondents had a post-secondary school qualification with 7.56 percent reporting that they had no formal schooling. Mean years of schooling was higher in the urban (8.11) than the rural sites (7.60). The majority of the respondents were married for both urban (62.63%) and rural sites (73.03%). Average years on treatment was 4.1 years in urban sites and 3.61 years in the rural sites. Table 1 presents the descriptive statistics of the respondents.

4.2. Monthly Costs of Accessing Anti-Retro Viral Treatment

Our study identified four main reasons for the participants to travel to the clinic for ART. These were: For routine check-ups; for refills of medication; for renal checks; and for CD4 count checks. The highest proportion of respondents travelled to the clinic for routine checkups and refills once every three months (36.97 % and 45.59 % respectively). For CD4 count and renal checks, the majority of respondents visited the clinic once every six months for these activities (60.08 % and 51.68 % respectively). For purposes of the analysis, we assumed that the respondents were able to access all these activities at any given visit and hence the activities could overlap i.e. an individual who went for refill of medication was also able to have a routine checkup and renal check during the same visit.

On average, most of the respondents did not have to go the clinics every month. In fact, majority of respondents went to the clinic maximum of once every three (39.50%) or two months (39.29%). The main mode of travel to the clinic was public transportation, namely mini-bus taxis, and walking (See Figure 1). In terms of time spent travelling to the health posts, the majority reported spending between fifteen to thirty minutes one way, implying that the respondents spent atleast thirty minutes on travel time on each visit. Generally, transportation times were higher in the urban setting than the rural setting, implying that those in rural areas travelled shorter distances to the clinics. The respondents were asked to cost how much they paid on every visit to the clinic and those who walked were asked to estimate how much it would have cost them if they were to use the mini-buses.

Table2 presents the overall mean of each cost (including those with zero costs for each category), the mean for those who paid some amounts (all those who paid more than zero per category) and the median costs of those with positive costs. Like similar cost studies, the distribution in our study was skewed, with the majority of respondents paying low amounts overall. The monthly cost of transportation to the clinic averaged $ 1.04 per month in the urban facilities while the rural areas had slightly higher costs at $ 1.10.[33]The median cost of transport for the respondents who paid any amount higher than zero averaged $ 0.73 in the urban areas while in the rural areas, it was at $ 1.0. The cost of transportation was therefore higher in rural than urban areas and this result is expected given the poorer state of roads in rural areas and the longer distances to the clinics.

The respondents reported having to spend a higher amount on special foods precipitated by the ARV medication than other costs. The main type of food stuff obtained were vegetables and fruits.

[2]Respondents were considered to be unemployed if they were not involved in any formal or informal income generating activities but were actively seeking it

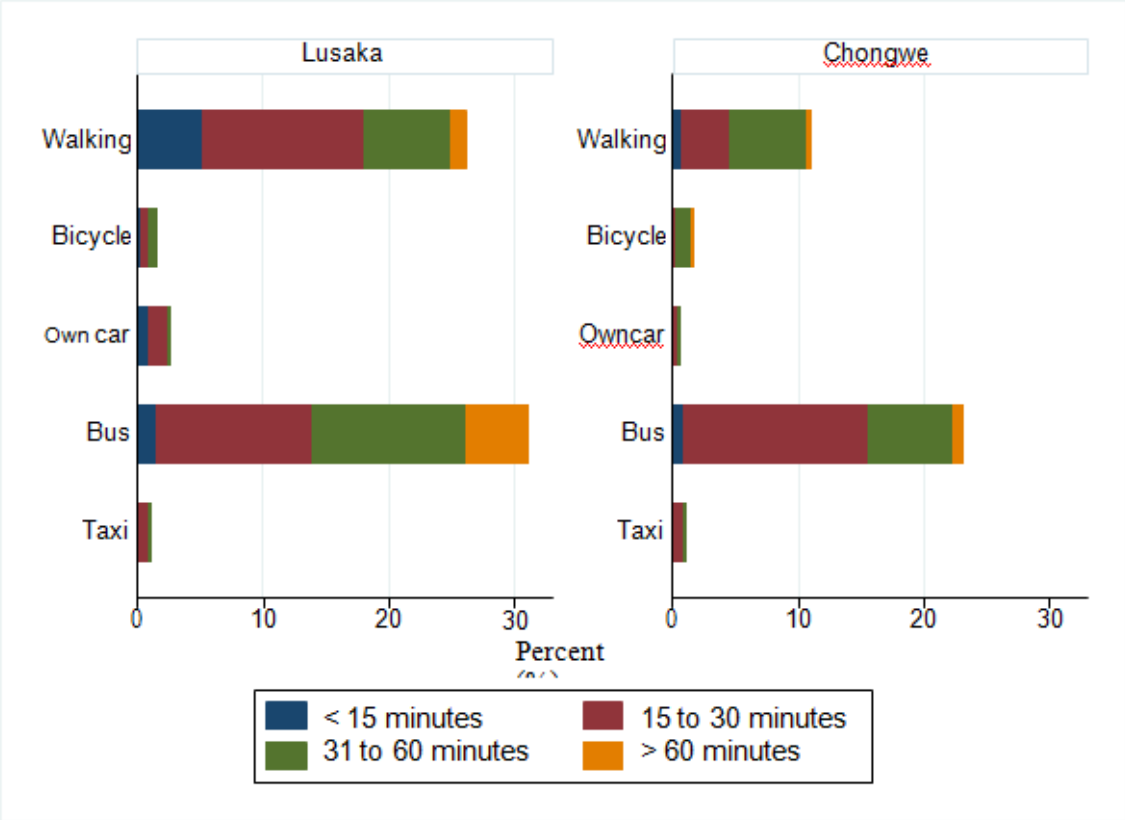
[3]$1= ZMK 10, $ refers to United States Dollars, ZMK is Zambian Kwacha

Table1: *Descriptive Sample Statistics*

Variables		**Urban**			**Rural**			
	n	Mean	S.D.	IQR	n	Mean	S.D.	IQR
Age (years)	297	39.19	10.15	18-70	179	35.82	8.37	21-68
Household Size	297	4.98	2.14	1-15	179	5.37	2.34	1-12
Education (years of schooling)	295	8.11	3.90	0-15	177	7.60	3.556	0-15
Household Income (gross nominal)	255	347.19	788.13	9.9-8000	163	183.53	209.75	5-1500
Years on treatment	271	4.10	3.46	0-15.23	172	3.61	3.30	0.21-11.64
Female (percent)	206	69.36			112	62.92		
Employed (percent)	235	79.39			159	89.33		
Marital status - married (percent)	186	62.63			130	73.03		

Notes: *The table presents descriptive statistics of the respondents. Monthly income levels were converted from Zambian Kwacha to United States dollars at the rate of $1= ZMK 10. Source: Authors computation from collected data.*

Figure1: *Mode of Transportation and Travel Time to the Health Facilities*



Notes: *The figure shows the type of transportation used and time spent travelling to the health posts. Time to go to the clinic for each type of transportation mode is calculated in minutes*

The overall mean for both locations was $9.89 while the median costs was $4, though for those who reported costs greater than zero, the mean was higher at $ 18.53. In terms of foregone income, as can be expected, the median amount foregone in urban area for those who had positive costs was two times higher than that in the rural areas at $ 10. The mean income cost for both areas was $9.77. With regard to additional household help, the mean was recorded at $ 44.98 in the urban area and $36.65 in the rural area. Excluding the latter cost, the mean client cost of HIV treatment in Zambia was estimated at $13.37 for urban areas and $11.69 for rural areas. The overall median cost was lower at $ 6.00. Up to 80 percent of respondents had total costs greater than zero total and the mean cost for those with positive costs was $ 16 and the median at $ 10.2.

Table2: *Average Monthly Costs Incurred by Study Subjects*

		Urban	Rural	All
Monetary Costs ($)				
Transport costs				
	Overall mean (SD)	1.04 (5.24)	1.10 (1.99)	1.06 (4.31)
	Median (IQR)	0.3 (0-88)	0.67 (0-22)	0.47 (0-88)
	% paying >0	60.94	81.56	68.70
	Mean, cost >0 (SD)	1.7 (6.64)	1.35 (2.12)	1.54(5.13)
	Median, cost >0 (IQR)	0.73 (0.07-88)	1 (0.2-22)	0.8 (0.07-88)
Special Foods				
	Overall mean (SD)	10.62 (15.37)	8.68 (14.33)	9.89 (15)
	Median (IQR)	4 (0-80)	0 (0-80)	4 (0-80)
	% paying >0	55.89	49.16	53.36
	Mean, cost >0 (SD)	19.00 (16.24)	17.66 (16.12)	18.53 (16.18)
	Median, cost >0 (IQR)	13 (2-80)	13 (0.8-80)	13 (0.8-80)
Time Costs ($)				
Foregone Income				
	Overall mean (SD)	1.71 (6.07)	1.91 (6.51)	1.79 (6.23)
	Median (IQR)	0 (0 -50)	0 (0-70)	0 (0-70)
	% paying >0	15.49	22.91	18.28
	Mean, cost >0 (SD)	11.06 (11.68)	8.32 (11.58)	9.77 (11.65)
	Median, cost >0 (IQR)	10 (0.5-50)	5 (2-70)	5 (0.5-700)
Total Costs ($)				
	Overall mean (SD)	13.37 (18.33)	11.69 (15.28)	12.73 (17.25)
	Median (IQR)	6 (0-116)	6 (0-80.67)	6 (0-116)
	% paying >0	74.07	88.83	79.62
	Mean, cost >0 (SD)	18.04 (19.22)	13.15 (15.60)	15.99 (17.94)
	Median, cost >0 (IQR)	106 (0.07-116)	8.33 (0.3- 80.67)	10.2 (0.07-116)

† less than 7 percent of total respondents reported needing extra household help and hence this amount was not included in total overall client costs.

Source: *Authors computation from collected data*

Factors That Predispose Individuals to High Treatment Costs

A binary logistic model was estimated to assess the factors which increased the probability of an individual having higher costs. Correlation analysis was first conducted to examine the a priori relationship between the unit costs and other variables, namely, education, age, income and years on treatment. The Pearson correlation analysis showed a statistically significant positive relationship between the education level and unit costs. Income and education were found to have a positive relationship, as per usual expectation while years on treatment was negatively related. The Pearson correlation coefficient matrix of the variables are presented in the appendix. The Spearman rank-order correlation coefficient was used to test the relationship between unit cost and the ordinal variables of interest. Our results show a weak positive association to sex, and a negative relationship to employment.

The results from the regression show that five variables had statistically significant effects which affected the probability that an individual faced higher costs than average (See Table 3). These were education, marital status, employment status, income and travel time to the clinic.

The results show that the logarithmic odds of having higher median unit costs rose on average by 1.06 for those in employment. Increased education also led to lower odds of having lower costs than either the mean or median costs. Furthermore, the logarithmic odds of having lower unit costs were found to decrease for increased household income. With respect to marital status, individuals who were divorced or separated had higher odds of having lower costs than average compared to those who were married while travel time was found to increase odd so having higher costs. Though insignificant, higher years on treatment and age increased the odds of having higher costs while males had lower odds. We explored the results further by obtaining the marginal effects of the variables and these are presented in the following section.

Table3. *Logit Results - Factors That Predispose Individuals to Higher Costs*

Dependent variable	<Median Costs		<Mean Costs	
	Model 1	Model 2	Model 3	Model 4
Household size	-0.02 (0.05)	0.03 (0.06)	-0.01 (0.05)	0.01 (0.06)
Age	0.02 (0.01)	0.03 (0.02)	0.02 (0.01)	0.01 (0.02)
Education	-0.11*** (0.03)	-0.08* (0.03)	-0.15*** (0.03)	-0.11** (0.04)
Sex				
Female	1	1	1	1
Male	-0.22 (0.20)	0.06 (0.25)	-0.51* (0.22)	-0.20 (0.25)
Locality				
Urban	1	1	1	1
Rural	0.02 (0.20)	-0.03 (0.25)	-0.23 (0.22)	-0.29 (0.25)
Income (log)		-0.18* (0.09)		-0.20* (0.09)
Years on treatment		0.02 (0.04)		0.07 (0.04)
Travel time		-0.40* (0.16)		-0.17 (0.15)
Marital Status				
Married		1		1
Divorced		0.70 (0.39)		1.02* (0.47)
Widowed		-0.02 (0.40)		0.03 (0.43)
Single		0.26 (0.45)		-0.09 (0.44)
Employed				
Yes		1		1
No		1.06** (0.35)		0.70 (0.40)
N	472	377	472	377
Pseudo R^2	0.038	0.082	0.071	0.092

Robust standard errors in parentheses $^{*}p<0.05$,$^{**}p<0.01$, $^{***}p<0.001$; constant omitted from results table. Source: Authors computation from collected data

Quantifying the effects on unit costs of changes in respondent characteristics

Results from the marginal effects analysis are shown in Table4. We find that an increase in education of an extra year led to two percent increased probability of having higher costs than the mean and median. The predicted probabilities of having higher unit costs increased by almost 40 percent for those who had tertiary education in the urban setting, compared to those who had no formal education, while it increased by 35 percent in rural areas. Further more, there was a 4 percent probability increase of higher costs for individuals as their income increased by a unit while travel time increased the probability of higher costs by 9 percent for the median costs and 3 percent for the mean. With regards to marital status, those who were divorced or separated were found to have an increased probability of having lower costs of up to 19 percent than those who were married. Furthermore, those in formal employment had a 24 percent probability of having higher unit costs than the median compared to those who were unemployed.

Table4. *Marginal Effects: Factors That Predispose Individuals to Different Client Costs of Accessing Art in Zambia*

	<Median	Costs	<Mean	Costs
Variable	Model 1	Model 2	Model 1	Model 2
Household size	-0.00 (0.01)	0.01 (0.01)	-0.00 (0.01)	0.00 (0.01)
Age	0.00 (0.00)	0.01* (0.00)	0.00 (0.00)	0.00 (0.00)
Education	-0.03*** (0.01)	-0.02* (0.01)	-0.03*** (0.01)	-0.02** (0.01)
Sex				
Female	1	1	1	1
Male	-0.05 (0.05)	0.01 (0.05)	-0.11* (0.05)	-0.04 (0.05)
Locality				
Urban	1	1	1	1
Rural	0.01 (0.05)	-0.01 (0.05)	-0.05 (0.04)	-0.06 (0.05)
Income		-0.04*(0.02)		-0.04* (0.02)
Years on Treatment		0.01 (0.01)		0.01 (0.01)
Travel time		-0.09** (0.03)		-0.03 (0.03)
Marital status				

Married		1		1
Divorced		0.16 (0.08)		0.19**(0.07)
Widowed		-0.00 (0.09)		0.01 (0.09)
Single		0.06 (0.10)		-0.02 (0.10)
Employed				
Yes		1		1
No		0.24** (0.07)		0.13 (0.07)
N	472	377	472	377

*$p<0.05$,**$p<0.01$, ***$p<0.001$;

Source: *Authors computation from collected data*

5. Discussion and Conclusion

The estimated mean client cost incurred in accessing ART of $13.37 in urban areas and $11.69 in rural areas is higher than previous approximations for health services patient costs in Zambia. Hjortsberg and Mwikisa [7] estimated an urban client cost of accessing health services of $ 10.8 while those in rural areas spent a much lower cost of $5.6. In comparison, our study finds higher costs for accessing ART in 2016, with the costs incurred for ART access in the urban area rising by 12 percent from the 2002 study on health costs while those in the rural areas had a 45 percent increase. The rise in costs for the urban areas over the period may be partly attributed to inflationary causes (rising cost of living), especially a rise in the cost of the basic food basket which was recorded at approximately $ 226 in 2010 but by 2016, had risen to $ 504 [8]. The higher costs reported in this study may also be explained by the fact that this study focused on people on HIV medication who may need special diets to support their treatment. In rural areas, the increase is substantial and our study suggests that clients in rural areas most likely face much higher costs for ART than clients for most other health ailments because of the need to go to specialised health facilities for the services. However, because of the limited scope of our study, we cannot conclusively determine the reasons for the difference in costs and this may be an important consideration for further research.

Distance to and mode of transport used to travel to the facilities is one of the main considerations that affect access to health care. Hjortsberg and Mwikisa [7] found that 56 percent of respondents from the rural areas in Zambia regarded distance from the health facility as an impediment to access in comparis on to house holds in other areas where between 7-16 percent found it problematic. In our study, we find that in addition to the distance barrier faced in the rural area, some of the respondents interviewed in the urban area reported travelling to clinics in other residential settlements distant from their homes to access treatment despite the presence of health facilities in their respective settlements. This is indicative of persistence of self-stigma against individuals who are HIV positive and is an added monetary and time cost to their access to treatment. We also find that travel time was one of the factors that contributed to individuals having higher costs and hence our findings are in line with the existing research.

Given that the national poverty levels in Zambia for 2015 were recorded at 54.4 percent with the amount being as high as 77 percent in rural areas, and the average national monthly household income in 2015 was $180 - $315 in urban areas and $ 81 in rural areas [2] - this amount spent on special food is a cause for concern and may be an important factor that discourages ART clients from continuing their treatment. However, the large costs of extra help we find is not in line with a priori expectations given that labour, particularly in rural areas is inexpensive. This may be explained by 2 reasons. Firstly, there were very few respondents in both localities who reported needing to hire extra help and this finding may be severely biased. Secondly, the extended family and community household support system usually comes into play in most cases of illnesses in Zambia, like other developing countries and hence most respondents would not have to pay for household help but those who do need it may have to access specialised treatment which may be more expensive.

Clients in rural areas were found to have lower total costs of ART access than those in urban areas. While this finding is similar to the costs involved in accessing health services in Zambia as shown by Hjortsberg and Mwikisa [7], a study done in South Africa found that client costs of ART access for those in rural clinics was more than three times that of those in urban

sites and double those in informal settlements with clinic fees and expenditures on other types of treatment (including traditional treatment) the biggest contributor to the costs being high [14]. The difference in results from ours may be explained by the variation in economic and cost structure of the two countries as well as less use of traditional treatment for ART in Zambia. Furthermore, though our study shows that study participants from urban areas incurred higher costs than their counterparts in rural areas, as a proportion of their income, rural study participants reported spent more on ART. This finding supports on-going discussions that people with HIV, especially in rural areas may need to benefit from existing government support mechanisms for vulnerable groups such as social cash transfer.

The study also found that an increase in education level led to higher costs. There are two possible reasons for this. The first is that as people become more educated, they have higher incomes and hence they are able to spend more on ART access costs while those who have low levels of education have lower incomes and hence they take as many measures as possible to keep the expenditures as close to zero, even if it means walking long distances to the clinics or eating less nutritious foods. Another possible explanation is an increase in self-stigmazation that comes with increased levels of education that leads those with higher incomes to seek treatment in areas where they cannot be identified by their neighbours. Our study identified that in urban areas, where the level of education is higher, clients travelled to clinics outside of the residences for treatment. A possible solution to this would be to introduce different modes of dispensing treatment which increase anonymity and hence reduces stigma. If self-stigmatization is one of the factors contributing to higher client costs, then this is a cause of concern as in most communities, more educated people are held in higher esteem and command respect. Therefore their acceptance of their positive status would be go some way in reducing the stigma around the disease.

With regards to increased income leading to higher unit cost, this result is expected and intuitive as we expect those with higher incomes to be able to have more variety interms of foods they can afford and possible transportation modes aside from walking and hence to have higher costs. This rationale can be extended to explain the finding that those who were unemployed had lower probabilities of having median costs lower than those employed. While intuitive, this may be a cause for concern as it may mean that those who are unemployed or have very low levels of household income may not be able to get as much dietary variety in their nutrition which is needed for those on ART and may only have the option of walking to clinics to access their treatment, both factors which may reduce adherence. Hence, they would benefit more from a social or food cash transfer program implemented by government or other community organisations. Because vegetables and fruits were identified as one of the main contributors to the high food costs, it may also be imperative for the community to be sensitized on traditional sources of nutrition which would fulfil their dietary needs but also be more affordable.

Research geared towards making ART more efficient interms of reduced costs to the providers has gained ground in recent years. The ultimate goal is sustainability of ART program. In our study, we estimate the actual cost that client face when accessing ART in rural and urban areas and show it is a sizeable component of total household income of respondents, especially in the rural areas. This calls for a more holistic approach to the sustainability of ART which incorporates and where necessary mitigates the client cost of access as a mode of increasing adherence. While the scope of this study was limited to Lusaka Province which has the highest per capita income of the country, it may be important to expand the ambit of the study and quantify the cost of accessing ART country-wide to have a better understanding of how client costs affect ART adherence nationally.

LIMITATION

The main limitations of the study was the inclusion only of ART clients who were attending the ART clinics at the health facilities due to budgetary considerations. This could have led to selection bias as only respondents who were well enough to come on their own to the clinic were interviewed. Those who were too ill to come to the clinic could not be included in the study and this may explain the small number of respondents on some of the costs, such as the cost of extra help. However, the extent of bias is limited as the ART program is Zambia has matured with relatively few people bedridden

due to HIV. As this study has reported, a high ART coverage and viral load suppression has been achieved by the ART Program. Despite this, the results from the study should be interpreted with caution and may be considered as being the lower bound, or near there of, of the client cost of accessing ART.

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APPENDIX

Table5: *Pearson Correlation Coefficients - Selected Variables*

	Unit Cost	Age	Education	Income	Treatment (yrs)
Lusaka (Urban Setting)					
Age	-0.04	1.00			
Education	0.32*	-0.14*	1.00		
Income	0.08	-0.03	0.20*	1.00	
Treatment (years)	-0.04	0.34*	0.05	0.17*	1.00

Notes: *The table shows correlation coefficients on selected variables in both the rural and urban setting. *indicates a statistically signifigant relationship at the 5 percent level.*

***Source*:** *Authors computation.*

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