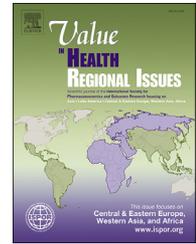




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Preference-Based Assessments

Willingness-to-Accept and Willingness-to-Pay Ratios of Prevention of Mother-to-Child Transmission Services in a Nigerian Hospital: A Cross-Sectional Contingent Valuation Study

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ABSTRACT

Background: In Nigeria, human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome treatment and care services, prevention of mother-to-child transmission (PMTCT) inclusive, are accessed free of charge by patients due to financial support from donor agencies. This trend may not be sustainable in the future due to the present global economic realities. Hence, there is the need to ascertain the readiness of PMTCT patients to pay for such services. **Objectives:** This contingent valuation study determined the willingness-to-accept (WTA), willingness-to-pay (WTP), and WTA-to-WTP ratios of PMTCT services among clients in a Nigerian tertiary hospital. **Methods:** This was a cross-sectional questionnaire-based study. All adult PMTCT patients who had never paid for any component of the services participated in the study. The questionnaire measured their WTP and WTA for the following components of PMTCT: primary prevention of HIV, prevention of unintended pregnancy in HIV-positive women, follow-up treatment and support, and therapeutic interventions around delivery. The WTP and WTA for PMTCT drugs and specialized clinical pharmacy services were also measured. The WTA-to-WTP ratios, income effects, and income elasticity were determined for all services. Questions were posed

using Naira (N) (\$1 = N250, at the time of the study). **Results:** Respondents aged 25 to 34 years comprised 80.8% of the population, whereas 80.8% were married. The mean amounts of WTA and WTP for services involving primary prevention of HIV was N543 000 and N18 600, respectively. Its WTA-to-WTP ratio and approximate income effect were 29.19 and -28.19, respectively. These variables were associated with WTP for some services: level of education with PMTCT follow-up treatment and support ($P=.046$), trimester of pregnancy with primary prevention of HIV ($P=.002$), correspondent's residence with specialized clinical pharmacy services ($P=.003$), and time spent to reach facility with primary prevention of HIV ($P=.002$). **Conclusions:** All services had high WTP, WTA-to-WTP ratios, and income effects, with inelastic income elasticity coefficients: patients in the Nigerian hospital attribute high value to all PMTCT services. **Keywords:** contingent valuation, HIV/AIDS, prevention of mother-to-child transmission, willingness to accept, willingness to pay.

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Introduction

The prevalence of human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) is still high despite the multinational efforts against the disease. As of 2016, the World Health Organization estimated that 36.7 million people were living with HIV/AIDS worldwide.¹ Of the total, 25.6 million people lived with the disease in Africa,² making it the most affected region in the world. Nigeria ranks as the second most affected

country in the world, with about 3.6 million people infected in 2016.^{3,4} In the same year, it also accounted for 59% of new infections within West and Central Africa. Women account for more than half (58%) of the infected Nigerians. An estimated 2.6 million children in the country have been orphaned by the disease.³⁻⁵

Currently, available treatment is lifelong, with no break period. But not all persons with the disease have access to antiretroviral medicines.¹ The assured means of reducing the global burden of the disease is the prevention of its transmission. Preventive

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strategies are targeted at vertical and horizontal routes of transmission. Horizontal transmission involves all means of transmission other than from infected mothers to their children. Mother-to-child transmission of HIV/AIDS is the transmission of the disease from an HIV-positive mother to her infant. The transmission can occur during pregnancy, labor, child delivery, or breastfeeding. Mother-to-child transmission accounts for over 90% of new HIV infections among children.⁶ About 37 000 children were newly infected with HIV in Nigeria as a result of vertical transmission in 2016.⁴ Prevention of mother-to-child transmission (PMTCT) is a 4-prong program that includes prenatal and postnatal services: primary prevention of HIV, prevention of intended pregnancies in HIV-positive women, follow-up treatment and support, and therapeutic interventions for the woman, her infant, and family.⁷ Only 32% of HIV-infected pregnant women access PMTCT services in Nigeria.^{4,5}

In Nigeria, like most other low- and middle-income countries, drugs for PMTCT and other HIV/AIDS services are provided at no cost to the patients. With the global economic crisis, the current norm may not be sustainable. In fact, there is a recent reduction in funding of HIV/AIDS treatment and care in Nigeria,⁸ a country where 95% of HIV/AIDS funding is from donor agencies.⁹ It is pertinent to inquire if the patients will be willing to pay for the drugs and related services that will sustain the supply. It is also important to determine the amount that they will be willing to part with to make an out-of-pocket purchase and the value that they attach to the drugs and other services, irrespective of their choices.

The objective of this contingent valuation study was to determine the willingness to accept (WTA), willingness to pay (WTP), and WTA-to-WTP ratios of PMTCT services among clients in a Nigerian health institution.

Methods

Description of Concept

Contingent valuation (CV) is a method in economics that uses WTP and WTA compensation to quantify the benefits patients attach to goods or services. The WTP is the maximum price that a consumer accepts to pay for a good or service.¹⁰ It is the highest price that the consumer agrees to pay for 1 unit of the good or service.¹¹ Knowledge of a product or service's WTP by (potential) customers plays a crucial role in marketing management such as in pricing decisions or new product development.¹² It is a key component of consumer demand, and its knowledge is critical in the process of pricing a commodity. It is conditional on the type of a certain good or service.¹¹

The WTA is the minimum monetary amount paid as compensation for an individual to forgo some good or to bear some harm.¹³ Individuals' minimum WTA is the sum that just compensates them for an impending loss because they would neither be worse off nor better off if they choose to accept the compensation and suffer the loss.¹⁴ Many works have shown that WTA values are consistently higher than those expressed for WTP for the same good¹³ and have found that there is a disparity between a consumer's WTP for a good and the same consumer's WTA compensation to forgo the same good.¹⁵ The WTA-to-WTP ratios give more information than WTP or WTA alone. They give further information not just about the value attributed to a healthcare good or service, but also about the capacity to resist the loss of the good or service or substitute it.¹⁶

Study Design

This was a cross-sectional questionnaire-based study. It involved the collection of responses from PMTCT patients at the HIV Unit of

Enugu State University Teaching Hospital Parklane. Enugu State University Teaching Hospital is a tertiary health institution, and its HIV services are at levels comparable to those of most other facilities in Nigeria. Ethical clearance was obtained from the health research ethics committee of the hospital.

Sampling

As a government facility, the services are currently rendered free of charge at the study site, but the possibility of asking patients to pay for the services later cannot be ruled out. Monitoring laboratory investigations such as viral load and CD4 count were once free services at HIV clinics in Nigeria. Later, the patients were asked to pay for the services. Also, it is possible that some patients who transferred to the study site from private facilities or other state facilities with limited supplies had paid for 1 or more components of the services at some times. Hence, all past and current adult patients (18 years and older) of PMTCT services in the study site who had never paid for any component of the services were approached to participate in the study. All 104 eligible participants agreed to respond to the questionnaire. Only 3 PMTCT patients did not qualify to be included in the study and were not approached: one was 17 years old and 2 stated that they sometimes buy the drugs whenever they could not honor their hospital appointments.

Study Instrument

A questionnaire was developed and used to elicit patients' responses about WTA and WTP based on the principles of CV (see Appendix in Supplemental Materials found at <https://doi.org/10.1016/j.vhri.2019.05.001>). Content validation of the questionnaire was done by pharmacoeconomics experts in the Department of Clinical Pharmacy and Pharmacy Management, University of Nigeria, Nsukka. Face validation of the questionnaire was conducted using 10 patients at Cottage Hospital, Enugu Ezike, who were also used for reliability determination. The first part of the questionnaire measured the demographic characteristics of the patients. The second part measured their WTP and WTA for the components of PMTCT: primary prevention of HIV, prevention of unintended pregnancy in HIV-positive women, follow-up treatment and support, and therapeutic interventions around delivery. The WTP and WTA for PMTCT drugs and specialized clinical pharmacy services were also measured. The price choices in the study were provided in 2 separate formats: open-ended and payment card. To take care of the issues in payment card design in the width of the discrete options, a decision was made to provide respondents with options that varied from an open minimum to an open maximum, with 3 fixed intervals between the two. The price ranges were spread around the prevailing estimated market prices of the goods or services at the time of the study. The price questions were only asked to those who gave positive WTP or WTA responses.

Study Procedure

All authors were involved in this stage after agreeing on a common procedure. Prospective respondents' consent was first sought, and then the meanings of WTA and WTP in simple terms were explained to them. They were provided necessary guidance throughout the procedure. After providing their demographic data, patients were asked whether they were willing to pay for the respective services. For each service, the respondents were given a detailed and uniform description of the services before they were asked about their choices. Those who accepted to pay were given a range of values to choose the maximum amount that they were willing to pay. They were also requested to state the exact amount that they were willing to pay. The respondents who declined to pay were asked to choose their reasons for no WTP. The

Table 1 – Respondents' sociodemographic characteristics (N = 104).

Characteristics		Frequency (n)	Percentage (%)
Age (years)	24 and younger	3	2.9
	25-34	84	80.8
	35-44	16	15.4
	45 and older	1	1.0
Marital status	Single	8	7.7
	Married	84	80.8
	Separated	4	3.8
	Divorced	1	1.0
	Widow	7	6.7
Employment status	Unemployed	5	4.8
	Housewife	15	14.4
	Student	2	1.9
	Self-employed	50	48.1
	Employed	32	30.8
Monthly income (Naira)	<18 000	9.6	10
	18 000-50 000	36.5	38
	>50 000-100 000	39.4	41
	>100 000-200 000	12.5	13
	>200 000-500 000	1.9	2
Satisfaction with income	Not sufficient	16	15.4
	Meets the need	64	61.5
	Allows savings	24	23.1
Health insurance	No	90	86.5
	Yes	14	13.5
Health status	Bad	6	5.8
	Average	36	34.6
	Good	62	59.6
Level of education	Non-formal	1	1.0
	Primary	4	3.8
	Secondary	43	41.3
	Tertiary	54	51.9
	Postgraduate	2	1.9

corresponding questions were asked for WTA compensation to forgo the PMTCT services.

Data Management and Analysis

The collected data were coded into Statistical Products and Services Solution (version 20 for Windows) and used to conduct statistical analyses. Frequencies, percentages, means, and minimum or maximum values were used to summarize the variables, whereas the chi-square test was used to determine the association between patients' socioeconomic characteristics and their

WTP and WTA responses. The strength of the associations was determined using Pearson correlation. Linear regression was used to determine the sociodemographic factors that were predictors of the WTP and WTA amounts and the WTA-to-WTP ratios. The WTA-to-WTP ratios for the PMTCT services were determined by dividing mean WTA amounts by their respective mean WTP amounts. Income effects were determined by subtracting WTA-to-WTP ratios from 1.¹⁷ Income elasticity of demand coefficients were determined using log-log regression model in which the β -coefficient values represent income elasticities for the services.

Unlike in a regular income elasticity formula that the denominator measures changes in quantity demand, changes in the proportion of patients who answered yes to WTP was used as the independent variable in the regression model because it is the measure of demand for the services.

All questions were posed using Naira (N); \$1 was equivalent to N250 at the time of the study. In all cases, P values of less than .05 were considered statistically significant.

Results

Characteristics of the Patients

Respondents aged 25 to 34 years comprised 80.8% of the sample, whereas 80.8% were married. Self-employed respondents were 48.2%. Most respondents (41%) earned 50 000 to 100 000 (Naira), whereas 61.5% were satisfied that their income met their needs (Table 1).

WTP and WTA Choices for the PMTCT Services

Primary prevention of HIV had a yes WTP response of 97.1%. All other services had a yes WTP response above 70%. The lowest yes WTA response was for PMTCT drugs alone (1.0%) (Table 2). For those who responded no WTP and no WTA for primary prevention of HIV, 66.7% reported that they could not pay, just as 25.3% were against accepting compensation to forgo any form of healthcare services (Tables 3 and 4).

WTP and WTA Exact Amounts for the PMTCT Services

The mean amounts of WTP and WTA for services involving primary prevention of HIV was N543 000 and N18 600, respectively. Its WTA-to-WTP ratio and approximate income effect were 29.19 and -28.19, respectively. The exact amounts of WTA and WTP, and the WTA-to-WTP ratios, are shown in Table 5 for other PMTCT services. The income elasticity of the demand coefficient for the primary prevention of HIV was 0.030 (95% CI: 0.001-0.059). Table 6 has the details for other variables.

Table 2 – Respondents' willingness to accept and willingness to pay for PMTCT services.

Clinical service	WTA (n [%])		WTP (n [%])	
	Yes	No	Yes	No
Primary prevention of HIV	5 (4.8)	99 (95.2)	101 (97.1)	3 (2.9)
Prevention of unintended pregnancy in HIV-positive women	18 (17.3)	86 (82.7)	76 (73.1)	28 (26.9)
Follow-up treatment and support for HIV-positive pregnant women	3 (2.9)	101 (97.1)	91 (87.5)	13 (12.5)
Therapeutic intervention around delivery	2 (1.9)	102 (98.1)	91 (87.5)	13 (12.5)
PMTCT drugs only	1 (1.0)	103 (99.0)	91 (87.5)	13 (12.5)
Specialized clinical pharmacy services	19 (18.3)	85 (81.7)	73 (70.2)	31 (29.8)

HIV indicates human immunodeficiency virus; PMTCT, prevention of mother-to-child transmission; WTA, willingness to accept; WTP, willingness to pay.

Table 3 – Respondents' reasons for “no” WTP and WTA.

Clinical Services		Frequency	Percentage
Primary prevention of HIV			
WTP	I cannot pay for the service	2	66.7
	I don't know	1	33.3
	Total	3	100.0
WTA	I cannot accept compensation to be denied the service	42	42.4
	I am against accepting compensation to be denied any form of healthcare service	25	25.3
	I object to accept compensation to be denied this level of service	19	19.2
	I both cannot and object to accept compensation to be denied the service	12	12.1
	I don't know	1	1.0
	Total	99	100.0
Prevention of unintended pregnancy			
WTP	I cannot pay	18	64.3
	I am against paying for any form of healthcare service	1	3.6
	I object to pay for this level of service	2	7.1
	I both cannot and object to pay for the service	5	17.9
	I don't know	2	7.1
Total	28	100.0	
WTA	I cannot accept compensation to be denied the service	51	59.3
	I am against accepting compensation to be denied any form of healthcare service	4	4.7
	I object to accept compensation for this level of service	12	14.0
	I both cannot and object to accept compensation to be denied this level of service	15	17.4
	I don't know	4	4.7
	Total	86	100.0
Follow-up treatment and support			
WTP	I cannot pay	10	76.9
	I object to pay for this level of service	1	7.7
	I both cannot and object to pay for the service	1	7.7
	I don't know	1	7.7
	Total	13	100.0
WTA	I cannot accept compensation to be denied the service	61	60.4
	I am against accepting compensation to be denied any form of healthcare service	7	6.9
	I object to accept compensation to be denied this level of service	17	16.8
	I both cannot and object to accept compensation to be denied the service	14	13.9
	I don't know	2	2.0
	Total	101	100.0

HIV indicates human immunodeficiency virus; WTA, willingness to accept; WTP, willingness to pay.

Association Between the Patients' Characteristics and Their WTP and WTA Choices

Among the variables analyzed for significant association with the WTP of the various PMTCT services, the level of education was found to be related to services involving PMTCT follow-up treatment and support ($X^2[4] = 9.669$, $P = .046$, $R = 0.246$); trimester of pregnancy with the primary prevention of HIV ($X^2[3] = 15.034$, $P = .002$, $R = -0.074$); correspondents' residence with specialized clinical pharmacy services ($X^2[3] = 13.617$, $P = .003$, $R = 0.250$); time spent to reach facility with both primary prevention of HIV ($X^2[3] = 15.375$, $P = .002$, $R = -0.251$); and follow-up treatment and support ($X^2[3] = 7.925$, $P = .048$, $R = -0.058$).

Employment status and household monthly income were both found to be related to WTA for specialized clinical pharmacy services ($P = .032$, $R = 0.191$ and $P = .041$, $R = 0.041$, respectively), marital status with PMTCT drugs alone ($P = .001$, $R = 0.094$), satisfaction with household monthly income with primary prevention of HIV ($P = .008$, $R = 0.264$), and trimester of pregnancy with PMTCT treatment and support ($P = .034$, $R = -0.217$).

Sociodemographic Determinants of WTA and WTP Exact Amounts, and WTA-to-WTP Ratios

Respondent residence was the only significant predictor of the exact WTP amount for primary prevention of HIV ($P = .045$), whereas level of education and time spent to reach facility were the statistically significant predictors of WTA amount for PMTCT treatment and support. [Tables 7 through 9](#) have the results for the regression analysis.

Discussion

The study employed the concept of contingent valuation to determine WTP, WTA, and WTA-to-WTP ratios of PMTCT services.

Characteristics of the Patients

The age and marital status distribution recorded in this study are similar to those of a WTA-WTP study on PMTCT services conducted in Malawi.¹⁸ Participants in the latter study had lower incomes, which are appreciated based on the economic disparity between the 2 countries. Okanda et al conducted a study among

Table 4 – Respondents' reasons for “no” WTP/WTA.

Clinical services		Frequency	Percentage
Primary prevention of HIV			
WTP	I cannot pay	9	69.2
	I object to pay for this level of service	1	7.7
	I cannot and object to pay for the service	1	7.7
	I don't know	2	15.4
	Total	13	100.0
WTA	I cannot accept compensation to be denied the service	60	58.8
	I am against accepting compensation to be denied any form of healthcare service	11	10.8
	I object to accept compensation to be denied this level of service	9	8.8
	I cannot and object to accept compensation to be denied the service	18	17.6
	I don't know	4	3.9
Total	102	100.0	
PMTCT drugs only			
WTP	I cannot pay	7	53.8
	I object to pay for this level of service	1	7.7
	I both cannot and object to pay for the service	3	23.1
	I don't know	2	15.4
	Total	13	100.0
WTA	I cannot accept compensation to be denied the service	57	55.3
	I am against accepting compensation to be denied any form of healthcare service	8	7.8
	I object to accept compensation to be denied this level of services	14	13.6
	I cannot and object to accept compensation to be denied the service	23	22.3
	I don't know	1	1.0
Total	103	100.0	
Specialized clinical pharmacy services			
WTP	I cannot pay	25	80.6
	I object to pay for this level of service	2	6.5
	I both cannot and object to pay for the service	1	3.2
	I don't know	3	9.7
	Total	31	100.0
WTA	I cannot accept compensation to be denied the service	56	65.9
	I am against accepting compensation to be denied any form of healthcare service	7	8.2
	I object to accept compensation to be denied this level of services	6	7.1
	I both cannot and object to accept compensation to be denied the service	13	15.3
	I don't know	3	3.5
Total	85	100	

HIV indicates human immunodeficiency virus; WTA, willingness to accept; WTP, willingness to pay.

Kenyan PMTCT enrollees, but with a different objective. They documented a number of socioeconomic characteristics of the women in the program.¹⁹ In their study, most respondents were married and had given birth to a child. But unlike in the present study, most of their respondents had primary level of education alone and were unemployed. A similar study carried out by Mamudu in Nigeria recorded that respondents were within a similar age range as that of this study.²⁰

WTP and WTA Choices for the PMTCT Services

Almost all the respondents were willing to pay for primary prevention of HIV. This meant that they preferred not to have been infected with HIV/AIDS in the first place. All the services had excellent WTP responses, but the least was expressed for specialized clinical pharmacy services. The WTA responses showed that specialized clinical pharmacy services had the highest value. Perhaps an improvement in pharmaceutical care services will change this attitude. Being served PMTCT drugs alone had the least WTA responses. Primary prevention of HIV had the highest WTA exact amount, whereas therapeutic intervention during delivery had the highest WTP exact amount. The PMTCT drugs had the least WTA-to-WTP ratio, whereas

specialized clinical pharmacy services had the highest ratio. Of all reasons given by patients for no WTP and WTA responses, inability to pay was the most adduced.

Not much work has been done on WTP for PMTCT services. Ayifa conducted a study in 3 hospitals in Ghana to determine patients' WTP for PMTCT services. The study documented that 91% of the respondents were willing to pay for PMTCT services.²¹ The WTP for other health services has been determined. Mbachu et al reported that 33.3% were willing to pay the first bid for antiretrovirals (ARVs) in a Nigerian hospital.²² Only 21.43% expressed WTP for treatment with ARVs in a Cameroonian study.²³ The 2 studies show that the patients on highly active antiretroviral therapy have different behavior from the PMTCT patients of the present study. Nevertheless, a study in Ethiopia had 68% of respondents willing to pay for contraceptives,²⁴ which is a value similar to a corresponding service measured in this study. Ezennia et al reported that although about half of their participants responded to WTP questions, almost all who responded (82.2%) were willing to pay for a malaria rapid diagnostic test kit.²⁵ A similar result was reported in studies on WTP for insecticide-treated mosquito nets in Nigeria²⁶ and Tanzania.²⁷ When patients in Ukraine were asked about their WTP for physician services at primary contact, most respondents (>70%)

Table 5 – Exact amount of respondents' WTA and WTP and their WTA-to-WTP ratios

Clinical services	WTA (N)		WTP(N)		WTA-to-WTP ratios	Income effect
	Mean	Min/Max	Mean	Min/Max		
Primary prevention of HIV	543 000	15 000/1 000 000	18 600	100/300 000	29.19	–28.19
Prevention of unintended pregnancy in HIV-positive pregnant women	85 500	500/1 000 000	1715.13	100/50 000	49.85	–48.85
Prevention of mother to child trans mission	37 000	5000/100 000	3817.03	300/20 000	9.69	–8.69
Follow up treatment and support	54 500	9000/100 000	5079.12	200/30 000	10.73	–9.73
PMTCT drugs only	5000	5000/5000	3492.31	400/30 000	1.43	–0.43
Specialized clinical pharmacy services	46 400	1000/500 000	454.03	40/2000	102.20	–101.20

HIV indicates human immunodeficiency virus; Max, maximum; min, minimum; PMTCT, prevention of mother-to-child transmission; WTA, willingness to accept; WTP, willingness to pay.

were willing to pay for most of the services described to them.²⁸ An exploratory analysis of WTP for some health benefits showed similar trends.²⁹

Chiwaula et al's study on CV for PMTCT services showed WTA responses and mean WTA amounts similar to those reported in this study.¹⁸ An HIV WTA study reported yes responses of 69%, 99%, and 98% for HIV test for participants, HIV counseling and testing as part of routine hospital services, and HIV testing for siblings of their reference child, respectively.³⁰ The values were for willingness to accept services, unlike the present study that is on willingness to accept compensation to forgo services. The near-universal WTA yes responses determined in this study mean that the participants prefer to receive PMTCT services to being paid any amount.

WTP and WTA Exact Amounts for the PMTCT Services

The wide range of the mean amount of WTP for the PMTCT services documented in this study is an indication of the values the patients attach to them. Only primary prevention of HIV had a WTP mean amount significantly higher than the national minimum wage of N18 000 in Nigeria. The documented WTP figures should be considered with caution, considering that there is wide income inequality in Nigeria. Nonetheless, only a very minute proportion of the respondents in this study had a monthly

household income less than the national minimum wage. The values were all higher than the one reported in the Ghanaian WTP for PMTCT services study.²¹ The difference could also be as a result of the currency devaluation in Nigeria, such that the over 5-year interval between the 2 studies could have been responsible for the variations.

WTA and WTP Ratios and Relationship With Income Effects and Income Elasticities

The Malawian study on PMTCT reported similar results to those of this study, in the difference between WTA and WTP.¹⁸ Martin-Fernandez et al also found WTA values higher than WTP values for home physician visits.¹³ These are supporting evidence to higher values of WTA over WTP, and even in discrete choice experiments.¹⁵ The WTA-to-WTP ratios, which show WTA–WTP disparity, are known measures of people's behavior as it relates to their economic preferences of goods and services.

A disparity between WTA and WTP exists for a number of reasons. In most cases, people are more willing to accept a higher amount for a commodity than they are willing to pay for it. The limits of the disparity could be such that WTP equals the individual's entire (finite) income, whereas WTA could be infinite.³¹ Income and substitution effects have been mentioned to be among the major determinants of the disparity.³² The presence of

Table 6 – Income elasticities of demand for PMTCT services using log-log regression model

Service	Dependent variables	Independent variables	β-Coefficient (Elasticity of demand)	95% CI for β		Standard error	P value
				Lower bound	Upper bound		
Primary prevention of HIV (PPH)	LNWTP_PPH	(Constant)	4.228	3.892	0.105	0.105	0.000
		LNIncome_PPH	0.030	0.001	0.059	0.009	0.046
Prevention of unintended pregnancy in HIV-positive pregnant women (PUP)	LNWTP_PUP	(Constant)	4.667	1.674	0.940	0.940	0.016
		LNIncome_PUP	–0.043	–0.302	0.081	0.081	0.637
Follow-up treatment and support (Follow_up)	LNWTP_Follow_up	(Constant)	2.268	–0.329	0.816	0.816	0.069
		LNIncome_Follow_up	0.187	–0.038	0.071	0.071	0.078
Therapeutic intervention during delivery (TID)	LNWTP_TID	(Constant)	2.906	1.007	4.805	0.597	0.017
		LNIncome_TID	0.133	–0.032	0.297	0.052	0.083
PMTCT drugs only	LNWTP_PMTCT_Drug_Only	(Constant)	3.395	2.199	4.591	0.376	0.003
		LNIncome_PMTCT_drugs only	0.092	–0.011	0.196	0.033	0.066
Specialized clinical pharmacy services (SCPS)	LNWTP_SCPS	(Constant)	0.905	–0.980	2.790	0.592	0.224
		LNIncome_SCPS	0.291	0.128	0.454	0.051	0.011

CI indicates confidence interval; HIV, human immunodeficiency virus; PMTCT, prevention of mother-to-child transmission.

Table 7 – Impact of sociodemographic factors on WTP exact amounts for the services.

Service		β -Coefficients	95.0% CI for β		P value
			Lower bound	Upper bound	
Primary prevention	(Constant)	–2143.436	–106 761.783	102 474.910	.967
	Level of education	7060.247	–19 171.575	33 292.069	.590
	Trimester of pregnancy	–10 829.819	–42 499.602	20 839.963	.494
	Respondent's residence area	31 646.823	667.748	62 625.899	.045
	Time spent to reach facility	–11 295.853	–34 213.231	11 621.526	.325
Prevention of unintended pregnancy	(Constant)	–9248.284	–25 987.760	7491.192	.269
	Level of education	3678.210	–339.063	7695.483	.071
	Trimester of pregnancy	–1178.772	–5979.652	3622.107	.621
	Respondent's residence area	1833.996	–2826.441	6494.433	.429
	Time spent to reach facility	–661.179	–4341.093	3018.736	.717
PMTCT Treatment and support	(Constant)	5331.533	–2612.717	13 275.784	.183
	Level of education	1323.944	–705.039	3352.928	.195
	Trimester of pregnancy	–1576.808	–3736.321	582.705	.148
	Respondent's residence area	336.027	–1682.748	2354.803	.738
	Time spent to reach facility	–1269.943	–2779.070	239.184	.097
Therapeutic intervention	(Constant)	4345.024	–4751.639	13 441.687	.339
	Level of education	1825.216	–351.758	4002.191	.098
	Trimester of pregnancy	–1713.562	–4497.202	1070.079	.220
	Respondent's residence area	1277.185	–1329.649	3884.019	.327
	Time spent to reach facility	–1480.281	–3394.820	434.257	.126
PMTCT Drugs only	(Constant)	2358.670	–2757.553	7474.893	.356
	Level of education	1347.880	136.054	2559.707	.030
	Trimester of pregnancy	–810.136	–2324.971	704.698	.286
	Respondent's residence area	1130.607	–316.213	2577.428	.122
	Time spent to reach facility	–1745.699	–2814.601	–676.796	.002
Specialized clinical pharmacy service	(Constant)	280.863	–590.279	1152.004	.516
	Level of education	93.174	–114.789	301.137	.369
	Trimester of pregnancy	12.700	–258.829	284.228	.925
	Respondent's residence area	102.810	–135.459	341.079	.386
	Time spent to reach facility	–167.114	–346.610	12.382	.067

CI indicates confidence interval; PMTCT, prevention of mother-to-child transmission; WTP, willingness to pay.

Table 8 – Impact of sociodemographic factors on WTA exact amounts for the services.

Service		β -coefficients	95.0% CI for β		P value
			Lower bound	Upper bound	
Primary prevention of HIV	(Constant)	–3 140 000.000	–38 226 154.617	31 946 154.617	.459
	Level of education	710 000.000	–6 213 132.800	7 633 132.800	.417
	Trimester of pregnancy	250 000.000	–5 251 948.044	5 751 948.044	.667
	Time spent to reach facility	275 000.000	–2 475 974.022	3 025 974.022	.425
	(Constant)	–18 181.067	–2 238 809.039	2 202 446.904	.985
Prevention of unintended pregnancy	Level of education	–25 891.995	–775 590.256	723 806.267	.935
	Trimester of pregnancy	–54 729.987	–575 262.875	465 802.900	.806
	Respondent's residence area	247 287.802	–437 312.835	931 888.438	.411
	Time spent to reach facility	8823.380	–338 784.237	356 430.996	.952
	(Constant)	256 000.000	256 000.000	256 000.000	
PMTCT Treatment and support	Level of education	–31 000.000	–31 000.000	–31 000.000	
	Time spent to reach facility	–63 000.000	–63 000.000	–63 000.000	
	(Constant)	–173 000.000	–173 000.000	–173 000.000	
Therapeutic intervention	Trimester of pregnancy	91 000.000	91 000.000	91 000.000	
	(Constant)	299 864.504	–797 569.937	1 397 298.945	.529
Specialized clinical pharmacy service	Level of education	–85 312.977	–448 610.259	277 984.305	.586
	Trimester of pregnancy	31 482.824	–310 550.258	373 515.907	.829
	Respondent's residence area	–16 526.718	–367 220.236	334 166.801	.912
	Time spent to reach facility	11 083.969	–233 851.008	256 018.947	.915
	(Constant)				

CI indicates confidence interval; HIV, human immunodeficiency virus; PMTCT, prevention of mother-to-child transmission; WTA, willingness to accept; WTP, willingness to pay.

Table 9 – Impact of sociodemographic factors on WTA-to-WTP ratios for the services.

Service		β -coefficients	95.0% CI for β		P value
			Lower bound	Upper bound	
WTA/WTP1	(constant)	–2.656	–2.669	–2.643	.000
	Trimester of pregnancy	1.330	1.325	1.336	.000
	Time spent to reach facility	–.002	–.005	.001	.065
WTA/WTP2	(constant)	.088	–.309	.485	.532
	Level of education	–.013	–.146	.119	.767
	Trimester of pregnancy	–.118	–.282	.046	
	Respondent's residence area	.173	–.020	.366	.065
	Time spent to reach facility	.027	–.064	.117	.414
WTA/WTP3	(Constant)	.304	.304	.304	
	Level of education	–.226	–.226	–.226	
	Time spent to reach facility	.382	.382	.382	
WTA/WTP6	(constant)	–.271	–.898	.357	.264
	Level of education	.042	–.129	.213	.490
	Trimester of pregnancy	–.025	–.196	.145	.669
	Respondent's residence area	.019	–.141	.180	.727
	Time spent to reach facility	.092	–.079	.263	.184

CI indicates confidence interval; PMTCT, prevention of mother-to-child transmission; WTA, willingness to accept; WTP, willingness to pay.

perfect or close substitutes for a good or service decreases WTP, whereas an increase in income can lead to an increase in both WTP and WTA.³² Income effect was objectively determined in this study. The absolute values were large for all services measured. Also, income elasticities were inelastic for all the services. For example, a 1% increase in income was found to be associated with a 0.03% increase in WTP for primary prevention of HIV. Therefore, changes in the respondents' income have relatively small (or no) effects on their demands for the services. This is an understandable behavior for PMTCT patients because the demand for the services should remain unchanged, irrespective of income.³³ As a medical service, one is not expected to demand quantities that are more than required or prescribed. Because of the essential nature of the service, income should also not cause a reduction in the quantities required, even if the income is lacking. Ezennia et al's study gave similar income elasticity results, but for malaria rapid diagnostic tests options.²⁵ Healthcare services in sub-Saharan Africa have been shown to be income inelastic.³⁴ The availability of substitute goods is a direct consequence of income effect,³⁵ although the substitution effect is understood to have a more major influence on WTA-to-WTP ratio than income effects.³⁶ The fewer substitutes that are available, the greater the disparity between WTP and WTA: this may be another explanation for the results of this study because PMTCT goods and services have no substitutes at present.

According to Pearce in his review of WTA-to-WTP ratios, values of 10.1 and 27.6 have been recorded for health and safety services and for public and non-market goods, respectively.¹⁴ He concluded that WTA-to-WTP ratios are higher for goods as they get farther away from being ordinary private goods. Also, large differences exist with income and substitution effects, especially for goods with low substitutability, as seen with public goods.¹⁴ This is portrayed in the results of this study. The ARVs, in Nigeria, are health or safety services and are more public than private goods because they are provided free to the patients. A study by Coursey et al also analyzed WTA-WTP disparity as a measure of differences in values of a good or service by both WTA and WTP.³⁷ They explained that WTA–WTP disparity arises owing to cognitive dissonance that does not largely apply on the WTP side but rather may be induced by the prospect of receiving money on the WTA side. This may explain why a few

respondents were willing to accept compensation in exchange to forgo some PMTCT services. It can thus be concluded that both the psychological theory of loss aversion and the economic theory (under-perception of the value of gains or overperception of the value of loss)³⁷ explain WTA–WTP disparity of the respondents in this study. Other possible causes of WTA–WTP disparity that could also account for the results of this study are endowment effect alone, mixed substitution and endowment effects, uncertainty about preferences, and even bias in questionnaire design.¹⁴ The results of this study explain all the prepositions about WTA-to-WTP ratios for healthcare services, especially for PMTCT.

Association Between the Patients' Characteristics and Their WTP and WTA Choices

Economic evaluations of PMTCT services carried out by Dabis et al showed that the services are extremely sensitive to parameters such as the cost of drugs, the cost of providing counseling and testing, and the prevalence of HIV.³⁵ The highest percentages of no WTP in this study came from respondents within lower income categories. This result is consistent with the findings of Grutters et al in which income was found to be related to WTA–WTP disparity.¹⁵ Nevertheless, all the associations recorded in this study were weak.

Sociodemographic Determinants of WTA and WTP Exact Amounts, and WTA/WTP Ratios

Not many factors had an impact on the WTA and WTP amounts and WTA-to-WTP ratios. Level of education has been found to be a determinant of WTP for public goods,³⁸ whereas the ability to pay was found to affect WTP for a healthcare service.³⁹

Limitations

The use of both open-ended and a payment card in determining the respondents' WTP and WTA amounts may be a strength of the study, but the appropriateness of modifying the payment card into price ranges is debatable. The modification was done in the realization that there is no consensus on the exact range between successive discrete points of a payment card.^{40,41} A study that will

measure the existence of a difference between this method and the established one may provide an objective contribution to the debate. There was a dilemma between asking all the WTP questions before their WTA counterparts for the measured services and mixing them. The 2 were presumed to give similar results because the measurement of several services in the study meant that irrespective of the option, the respondents will know that WTP and WTA questions will be asked for all the services. Thus, the sequence was alternated among the 6 services. Uniform descriptions of the measured services were provided to the respondents, but prior knowledge of the services entailing more than the descriptions might have influenced some responses. Efforts were made to ensure that the intentions of the questions were clear and unambiguous. There is the possibility that the respondents undervalued the measured services if they thought that the study will be used to fix prices in the future. But they were informed, ab initio, that the study was not a prelude to asking them to pay for the services, and even if they are to be asked to pay, the study was not connected in any way to any agency that will fix price for the services. A limitation of CV methods that is also evident in this study is that the study presented hypothetical market scenarios. There is the possibility that the expressed WTA and WTP choices and amounts by some respondents may not correspond to what they will accept or offer in real-life situations. Nonetheless, it is an invaluable insight into the benefits that they attach to the services studied.

Conclusion

In this study, most respondents were willing to pay for the various PMTCT services, with very few willing to accept compensation to forgo the same services. Their mean exact WTP and WTA amounts were highest for primary prevention of HIV. All services had high WTA-to-WTP ratios and income effects, with income elasticity coefficients that were inelastic. Their socioeconomic characteristics were weakly associated with their WTP and WTA responses. It is thus concluded that patients in this Nigerian hospital attribute high value to all PMTCT-related services.

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Supplemental Material

Supplementary data associated with this article can be found in the online version at <https://doi.org/10.1016/j.vhri.2019.05.001>.

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