Willingness-to-pay for home delivery of antiretrovirals: A cross-sectional contingent valuation study in Southern Nigeria

Nnenna Ajagu*[1], Maureen Anetoh[2], Chukwuemeka Azubike[3], Adaora Agatha Ugwu[4], Beatrice Arunsi Kalu[5], Sunday Nduka[2]

[1]Department of Clinical Pharmacy and Biopharmaceutics, Faculty of Pharmaceutical Sciences, Enugu State University of Science and Technology, Enugu, Nigeria.
[2]Department of Clinical Pharmacy and Pharmacy Management, Faculty of Pharmaceutical Sciences, Nnamdi Azikiwe University Awka, Nigeria.
[3]Department of Pharmaceutics, Faculty of Pharmaceutical Sciences, University of Lagos,Lagos State, Nigeria.
[4]Department Pharmaceutics and Drug Development, Faculty of Pharmaceutical Sciences, Enugu State University of Science and Technology, Enugu, Nigeria.
[5]Department of Clinical Pharmacy and Pharmacy Administration. Faculty of Pharmaceutical Sciences, State University of Medical and Applied Sciences Enugu State, Nigeria.

Submitted: 14th Jan., 2025; Accepted: 15th Jan., 2025; Published online: 28th Feb., 2025
DOI: https://doi.org/10.54117/jcbr.v5i1.2
**Corresponding Author: Nnenna Ajagu; ajagunnenna@gmail.com*

Abstract

Home delivery enhances access to antiretrovirals through differentiated care. This study aimed to assess the willingness-to-pay for home delivery of antiretrovirals by people living with HIV in the southern part of Nigeria using a contingent valuation method. The study is a cross-sectional study and it was conducted in the HIV centers in three federal teaching hospitals located in three regions of the geopolitical zones in the southern part of Nigeria. The study was carried out from April 2022 to March 2023. A total of 945 self-administered questionnaires were distributed to HIV clients, and the willingness to pay was investigated using a contingent valuation technique. The predictors for the willingness-to-pay were explored using multiple logistic regressions. Majority (70%) of the respondents were not willing to pay for the delivery of their antiretrovirals to their homes. Out of those willing to pay, only one-third of them were willing to pay a monthly stipend of $1.3 ± 0.4 for the drug delivery. Furthermore, this study found that respondents employed in the private sector are more willing to pay for the delivery of antiretrovirals to their homes, with an odds ratio of 3.2, a 95% confidence interval of (1.43-7.00), and a p-value of 0.004.The study found that most persons living with HIV in the southern part of

Nigeria are unwilling to pay for home delivery of their antiretrovirals, despite receiving free antiretrovirals from healthcare facilities.

Keywords: HIV positive patients, Antiretrovirals, Home delivery, Southern Nigeria, Willingness to pay

Introduction

Delayed access to HIV medications has had extremely unpredictable consequences over the years despite tremendous victories in the global war against HIV/AIDS (UNAIDS 2022; Bangsberg, 2008; Barré-Sinoussi*et al*., 2013; Al Awaidy, *et al*., 2023, Jiang *et al.*, 2022). Most importantly, it has caused setbacks in the giant achievements made so far in HIV management (Mirkuzie*et al.*, 2021; Jiang *et al.*, 2022; Joseph *et al.*, 2022) which has varied greatly across geography especially in Africa, which accounts for nearly 60% of new HIV infections worldwide (Joseph *et al.*, 2022; UNAIDS *2022*; Santos *et al.*, 2022; Al Awaidy*et al.*2023).

In recent times, Nigerian government and researchers have explored various ways to increase access to ARV therapy, but a remarkable breakthrough occurred when the WHO modified all CD4 cell count thresholds in its treatment guidelines and recommended the "test and treat" therapy for all people living with HIV (Ridgway *et al*., 2020). This development led to a significant increase in the stable patient cohort and a corresponding rise in the number of individuals on antiretroviral therapy (ART). However, this increased number of patients on ART significantly burdened the already fragile health system. As a result, HIV clients who visit health facilities to access care often complained of long queues and lack of flexibility of the HIV clinics to work schedules of HIV clients (Duff *et al.*, 2010; Ajagu, *et al.,* 2017).

To solve this new problem, Nigeria adopted a national policy on task shifting and task sharing for essential health care services. One of the outcomes of this policy was the adoption of home delivery of ART to HIV-stable clients who had been on antiretrovirals for at least six(6)months. Reports from Nigeria and Laos showed that home delivery ensured uninterrupted access to HIV treatment especially during COVID-19 (Hoke *et al.*, 2021). However, to our knowledge, no study in Nigeria has assessed HIV clients' willingness to pay for the home delivery of

their ART medication in Nigeria. Therefore, this study designed to investigate the willingness of HIV-positive clients to pay for home delivery of antiretroviral drugs. In addition, factors that affected the choices for home delivery among people living with HIV (PLWH) in Nigeria will be explored.

Methods

Study design and setting

This cross-sectional study used a structured self-administered questionnaire that was distributed to HIV patients receiving ART medication in federal teaching hospitals located in three geopolitical zones in the southern part of Nigeria (i.e., one federal teaching hospital from the southeast; University of Nigeria Teaching Hospital in Enugu State, south-south; University of Port Harcourt in Rivers State and southwest; University of Lagos in Lagos State) was conveniently selected for the study. The study was conducted from April 2022 to March 2023.

Participants

This study only included HIV-positive clients over the age of 18 years accessing care in the eligible hospitals who gave their oral informed consent. The study excluded all HIV-positive patients admitted to inpatient wards and those who were not up to six months in HIV Care in the eligible hospitals.

Sample size and type

At the time of carrying out this study, information from the resource persons at the HAART to HAART clinics in each of the tertiary teaching hospitals revealed that about 3400 patients were attended to monthly. This number is made up of 900 at the University of Port Harcourt (UPTH), Rivers state in the south-south, 1200 for the University of Nigeria Teaching Hospital in the southeast, Enugu state, and 1300 for Lagos State University Teaching Hospital, Lagos state, in southwest Nigeria. The study determined an appropriate sample size of 270 for the University of Port Harcourt (UPTH), River State; 292 for the University of Nigeria Teaching Hospital, Enugu State; and 297 for the Lagos State University Teaching Hospital, Lagos State, by considering the population in each hospital and assuming a 95% confidence level with a confidence interval of less than 12 in each case. An additional 10% of the total calculated sample size (859) was

distributed in the ratio of 1:1:1 to the population to accommodate non-usable questionnaires due to improper filling. So, a total of 946 questionnaires were conveniently distributed in the hospitals as follows: 299 for the University of Port Harcourt (UPTH), Rivers State; 321 for the University of Nigeria Teaching Hospital, Enugu State; and 326 for Lagos State University Teaching Hospital, Lagos. We distributed the questionnaires to HIV-positive patients who consented to participate, based on the estimated sample size from each hospital, until we reached the expected population number.

Data collection tool and technique

The study developed and validated a questionnaire based on a validated semi-structured interview questionnaire by Geldsetzer *et al.* (2020) on willingness to pay for community delivery of antiretroviral medication and a self-administered question by Anosike *et al*. (2020) on home telemonitoring. The modified questionnaire consisted of 19 items. Experts in the fields of pharmacy practice and pharmacoeconomics assessed the content and face validity of the instrument. The questionnaire was pilot tested on twenty ART adult clients at Enugu State University Teaching Hospital Parkline under the approval number ESUTHP/C-MAC/034/VOL-3165. Following data collection, item analysis and corrected item-total correlation were assessed, and a corrected item-total correlation value of 0.3 or higher was obtained for all items. Furthermore, Cronbach's Alpha was used to assess the reliability of the instrument, and a value of 0.7 was obtained. A trained research assistant approached potential clients at the refill pharmacies located in the teaching hospitals. The purpose of the study was explained to the eligible clients.

Ethical consideration

The study received ethical approval from the ethics committees of each of the teaching hospitals involved:UPTH/ADM/90/S.II/VOL.XI/1422, UN/HREC/202206/501, and ADM/DSCST/HREC/APP/5587. Oral informed consent was obtained before the questionnaire was issued to the participant.

Statistical analysis

The retrieved questionnaires were checked for correctness and appropriateness and then sorted and coded into an Excel spreadsheet

and analyzed with the SPSS software version 20. A multiple binary logistic regression was performed to determine the factors that can affect respondents' willingness to pay (WTP) using the Enter method. The level of statistical significance (α) was considered significant at p-value <0.05. The willingness to pay was coded as yes = 1, no = 0, and it was used as the dependent variable while independent variables were categorized into the following variables: socio-economic characteristics, self-disclosure, and self-reported adherence.

Results

Of the 922 clients that participated in this study, over half (62.8%) were females, and most (52.2%) were between the ages of 18-27 years (Table 1). Also, a little less than half of the participants were married (45.7%), and only one-third had a secondary level of education (34.3%). A good number of the participants had commenced HAART for more than one year, with more than half (70.1%) reporting viral suppression. Most of the respondents (31.8%) indicated that they earn a monthly income of₦18,001-50,000(US$15-US$41.7). Of these groups, more than half (58.9%) responded that their income is insufficient to meet their needs. Additionally, 70% of respondents are unwilling to pay for ARV delivery to their homes. Only one-third of those who were willing to pay (30%) were willing to pay within the range of ₦150-1950 (US$0.1-US$1.3)for drug delivery within the state and within the same range for drug delivery outside the state.

Table 1: Socio-economic Characteristics

Socioeconomic Characteristics		**Frequency**	**Percentage**
Gender (n=922)	Female	579	62.8
	Male	343	37.2

Age in years (n=919)	18-27	480	52.3
	28-37	308	33.5
	38-47	73	7.9
	48-57	58	6.3
	>58	0	0.0
Highest Level of Education (n=916)	No formal education.	87	9.5
	Primary School	295	32.4
	Secondary School	310	33.8
	Higher Institution	224	24.3
Occupation (n=911)	Student	41	4.4
	Government Employee	133	14.4
	Self-Employed	340	37.3
	Private sector employee	348	37.7
	Unemployed	49	5.3
Marital Status (n=920)	Single	372	40.4
	Married	415	45.1
	Divorced	22	2.4
	Widowed	111	12.1
Commenced HAART (n=922)	6 months	259	28.1
	7-12 months	259	28.1
	13-24months	98	10.6
	>24 Months	306	33.2
Baseline Viral load (n=902)	Unsuppressed	73	8.1

	Suppressed	626	69.4
	I don't know.	203	22.5
Health insurance status (n=922)	Yes	368	39.9
	No	554	60.1
Earning per month (n=900)	< ₦18,000 (US$15)	265	29.4
	₦18,001-50,000(US$15-US41.7)	293	32.6
	₦50,001-100,000(US$41.7-US$83.3)	180	20.0
	₦100,001-200,000(US$83.3-US$166.7)	77	7.9
	₦ 200,001-500,000(US$166.7-US$416.7)	73	8.1
	>₦500,001 (US$ 416.7)	12	1.3
Income description (n=921)	Insufficient	543	58.9
	Meet the need.	248	27.0
	Allows savings	130	14.1
WTP (n=922)	NO:	645	70.0
	YES:	277	30.0
WTP (amount within the state) n=277	₦150-1950 (US$0.1-US$1.3)	170	61.6
	₦1951-3300(US$1.31-US$2.2)	46	16.6
	₦ 3300-4350(US$2.1-US$2.9)	54	19.5
	≥ 4500(US$3.0)	7	2.5
WTP (amount outside the state): n = 277	₦150-1950 (US$0.1-US$1.3)	98	35.4
	₦1951-3300(US$1.31-US$2.2)	94	33.9
	₦ 3300-4350(US$2.1-US$2.9)	80	28.9
	≥ 4500(US$3.0)	5	1.8

WTP	₦1950±600(US$1.3 ± 0.4)		

*@ August 2023 $1 = ₦1500 in Nigerian black market(http://www.exchangerates.org.uk)

Table 2 illustrates the relationship between the level of HIV status self-disclosure and self-reported ART adherence and the willingness to pay for home delivery of ARVs. The study found that most of those who revealed their status to their spouses (10.1%) were willing to pay, which was significant at a p-value of 0.00. Furthermore, despite their level of dissatisfaction with the facility refill, seventy percent of the respondents were unwilling to pay for the home delivery service. The respondents who expressed dissatisfaction did not express a willingness to pay for the home delivery of ARVs, a finding that was not statistically significant at a p-value of 0.08.

Table 2: Relationship between the level of HIV status self-disclosure and self-reported ART adherence on willingness-to-pay for home delivery of ARVs

Variables		**WTP**		**p-value**
		NO	**YES**	
Self-Disclosure	Friend	53 (5.7)	35(3.8)	0.00*
	Sibling	200 (21.7)	74 (8.0)	
	Religious leader	65 (7.0)	21 (2.3)	
	Spouse	82 (8.9)	93 (10.1)	
	Parent	182 (19.7)	39 (4.2)	
	Children	40 (4.3)	6(0.7)	
	No one	23(2.5)	9(1.0)	
Patient satisfaction with a hospital refill	Not Satisfied	392 (42.7)	183 (20.0)	0.08
	Satisfied	249 (27.2)	93 (10.1)	
Income	Insufficient	386 (41.9)	157 (17.0)	0.41

	Meets the need. Allows savings	166 (18.0) 93 (10.1)	93 (9.0) 37 (4.0)	
Reasons for the missed appointment	Bad experience with clinics No excuses from work. No transport Lack of time Felt better Rude staff Too sick to travel. Long queues at the clinics	7(2.7) 93 (36.5) 15(5.9) 14(5.5) 7(2,7) 4(1.6) 2(0.8) 5(2.0)	4(1.6) 53 (20.8) 23 (9.0) 4(1.6) 8(3.1) 2(0.8) 4(1.6) 10(3.9)	0.02*

The willingness to pay for ARV delivery service using a logistic regression is evaluated based on demographic characteristics (table 3). The table shows no significant correlation between the WTP for home delivery of ARVs and socio-demographic variables like gender, age, marital status, income description, or health insurance. There is, however, a strong link between the level of education of the patient and their willingness to pay for the delivery of their ARV (odds ratio = 1.3, 95% confidence interval (CI) = 1.11–1.54, p-value = 0.001). Also, respondents' occupations significantly affected their willingness to pay for ARV delivery at a ratio of 1.2, a 95% CI of 1.05-1.42, and a p-value of 0.03. Perceived patient satisfaction with their hospital/facility refill significantly influences the patient's willingness to pay (WTP), with an odds ratio of 2.17, a 95% confidence interval (CI) of 1.09-4.64, and a p-value of 0.04.

Table 3. Logistic regression analysis of the respondents' demographic characteristics and their willingness to pay for the ARV home delivery service.

Demographic characteristics	**Willingness to pay (yes = 1, no = 0), n = 277 OR (95% CI)**	**p-value**
Gender	1.10 (0.81-1.48)	0.50
Age in years	0.88 (0.73-1.07)	0.20
Highest level of education	1.30 (1.11-1.54)	0.001*
Occupation	1.20 (1.05-1.42)	0.03*
Marital status	1.20(0.98 - 1.37)	0.08
Health insurance	1.30 (0.95-1.84)	0.09
Earnings per month	1.00 (0.77-1.23)	0.82
Income description	1.00 (0.80–1.22)	0.91
Patient satisfaction with a facility refill	2.17 (1.09-4.64)	0.04*

*OR Odds ratio

Multiple binary regressions were used to further analyze the three socio-demographic variables that significantly affected the WTP (Table 4). This was done to show the predictors of the patient's willingness to pay for home delivery of their antiretrovirals. It was fascinating to find out that an individual's education level significantly affects the willingness to pay for home delivery at p-values of 0.001, and 0.001, respectively. That also showed that respondents employed in the private sector were also more likely to pay for home delivery of their ARVs, with an odds ratio of 3.2 and a 95% CI of 1.43-7.00 at a p-value of 0.004.

Table 4: Predictors of Willingness-to-Pay for Home Delivery of ART by HIV Patients

Demographic characteristics	**Willingness to pay (yes = 1, no = 0), n = 277 OR (95% CI)**	**p-value**
Occupation		
Student	1.30 (0.43-3.60)	0.69
Govt. Employee	2.00 (0.86-4.70)	0.11
Self-Employed	1.30 (0.90-3.00)	0.50
A private sector employee	3.20 (1.43-7.00)	0.004*
Unemployed	Referent	
Highest level of education		
Primary school	0.51 (0.29-0.88)	0.06
Secondary school	0.53 (0.36-0.78)	0.001*
Tertiary institution	0.47 (0.32-0.68)	0.001*
No formal education.	Referent	

OR: odds ratio; CI: confidence interval; WTP: willingness to pay

Discussion

The study revealed that more than half of the HIV clients were not willing to pay for the delivery of their ART, while the rest were willing to pay an average of ₦1950±600 (US$1.3 ± 0.4)for the home delivery of their ART. The study also observed that patients' level of education, occupation, and satisfaction were more likely to influence their willing to pay for the delivery of the ARTs, while one of the most frequently reported reasons the respondents gave for not accepting payment was that during the

delivery process people might suspect that they have HIV.

The majority of respondents were female. This finding aligns with a United Nations report that indicates a higher number of women living with HIV than men (Office on Women Healht 2022). This is likely due to the higher risk of HIV infection among women compared to men (Office on Women Health 2022). The study also revealed that a majority of respondents lacked health insurance, which could potentially hinder their willingness-to-pay for this delivery service. This is because insurance companies' coverage permits patients to make co-payments to access hospital services, thereby lowering the cost of health care for those services not being catered for by the government. To back up this claim even more, a study by Anosike *et al*., 2020, and Javan-Noughabi, 2017, found that having health insurance is a strong indicator of how willing people with chronic diseases were to pay for home telemonitoring services provided by pharmacists (Javan-Noughabi*et al*., 2017; Anosike *et al.,* 2020).

Furthermore, greater number of the participants earned between₦18,001-50,000(US$15-US41.7) per month. This is below subsistence, and it is a major reason why a larger number are not willing to pay. Previous studies have shown that participants' socioeconomic status can influence patients 'willingness to pay for home delivery of the ARVs, as such, those patients with higher salaries were more willing to pay for a monthly supply of their drugs compared to those with lower incomes (Anosike, C. *et al.*2020). Javan-Noughabi*et al*. in 2017 reported that the patients' unemployment status significantly contributed to inability to pay for medication, implying that individuals with low and unstable incomes lack the financial means to cover essential services such as home delivery of medication. Therefore, over three-quarters of individuals infected with HIV/AIDS may not be able to regularly pay for their home delivery services, even if they are required or are willing to. Infact, home delivery will actually reduce the indirect costs patients currently incur including transportation, meals, and other opportunity costs, to access and maintain treatment at refill sites (Barnabas *et al*., 2022). Therefore, if patients have the means to pay for medication delivery to their homes, their total cost will significantly decrease.

A majority of study participants had some form of formal education. The willingness to pay for ARV delivery corelated positively with the level of education. As reported in previous studies, education was a significant predictor of WTP for certain health services (Javan-Noughabi*et al.*, 2017; Guidry *et al.*, 2021). This so because it has been established that higher levels of education are associated with a range of health benefits including greater remuneration, greater social mobility, fewer co-morbidities and longer life expectancy (Davies *et al.*, 2018). However, in this class of patients, the common reason for missed appointment refills was the inability to find an excuse from their workplace, since they work in more cooperate environment which definitely influences their willingness to pay for home delivery. The findings of this study are consistent with those of Ajagu *et al*. in 2017 and Nnenna *et al*2022 on an expanded assessment of HIV care (Ajagu, Anetoh, and Nduka, 2017; Nnenna *et al.*, 2022).

Overall, it's concerning that the majority of HIV patients in this study, despite receiving free antiretrovirals from health facilities in Nigeria (Mbachu *et al.,* 2018), expressed no desire to pay for home delivery of their antiretrovirals. In 2021, Geldsetzer *et al*. conducted a study on the willingness to pay for community delivery of antiretroviral treatment in urban Tanzania, where they assessed the willingness to pay for patients receiving antiretrovirals from a nearby facility. However, the study by Geldsetzer *et al* differs from this study in that the Geldsetzer *et al* used cluster randomized trial model, so, patients in the cluster randomized study having previously experienced the delivery model, which may have positively influenced their choice to pay for the home delivery (Ascal *et al*., 2020).

Some of the respondents indicated that they would not pay for home delivery of ARVs due to the possibility of being suspected of having HIV in during the process. This is the fear of being stigmatized. One of the main obstacles to patients receiving testing, treatment, and care is HIV-related stigma(Wanjala *et al*., 2022). Stigma is difficult to evaluate or measure and few studies have sought to determine whether it is a factor that causes people not to opt for home delivery (Wanjala *et al*., 2022). A study by Jürgensen *et al*. (2013) on HIV-related stigma in Zambia, on the other hand, found that self-disclosure made home-based voluntary counseling and testing more socially desirable

(Jürgensen *et al.,* 2013). This observation suggests that stigma can influence a patient's willingness-to-pay, highlighting the need for further research to understand how patient-perceived stigma influences patient's choice in home delivery.

Conclusions

The study found that most Nigerians living with HIV in the south are unwilling to pay for home delivery of their antiretrovirals, despite receiving free ones from healthcare facilities. Those who indicated their interest in home delivery are willing to pay ₦1950±600(US$1.3 ± 0.4)where most of their choice is influenced by their level of education, occupation, and satisfaction with hospital refill.

References

Adepoju, P. (2020) 'Nigeria aligns efforts for HIV epidemic control by 2030', *The Lancet HIV*. Elsevier Ltd, 7(11), pp. e736–e737. doi: 10.1016/S2352-3018(20)30275-7.

Ajagu, N., Anetoh, M. U. and Nduka, S. O. (2017) 'Expanding HIV/AIDS care service sites: A cross sectional survey of community pharmacists' views in South-East, Nigeria', *Journal of Pharmaceutical Policy and Practice*. Journal of Pharmaceutical Policy and Practice, 10(1), pp. 1–12. doi: 10.1186/s40545-017-0122-x.

Anosike, C. *et al.* (2020) 'Willingness to pay for pharmacist-provided home telemonitoring among patients with chronic diseases in Enugu metropolis', *Health Informatics Journal*, 26(2), pp. 829–840. doi: 10.1177/1460458219852534.

Ascal *et al.* (2020) 'Willingness to pay for community delivery of antiretroviral treatment in urban Tanzania: A cross-sectional survey', *Health Policy and Planning*. Oxford University Press, 35(10), pp. 1300–1308. doi: 10.1093/heapol/czaa088.

Al Awaidy, S., Ghazy, R. M. and Mahomed, O. (2023) 'Correction: Progress of the Gulf Cooperation Council (GCC) Countries Towards Achieving the 95–95–95 UNAIDS Targets: A Review (Journal of Epidemiology and Global Health, (2023), 13, 3, (397-406), 10.1007/s44197-023-00097-1)', *Journal of Epidemiology and Global Health*. Springer Science and Business Media B.V., p. 589. doi: 10.1007/s44197-023-00129-w.

Bangsberg, D. R. (2008) 'Preventing HIV antiretroviral resistance through better monitoring of treatment adherence', *Journal*

of Infectious Diseases. doi: 10.1086/533415.

Barnabas, R. V. *et al.*(2022) 'Fee for home delivery and monitoring of antiretroviral therapy for HIV infection compared with standard clinic-based services in South Africa: a randomised controlled trial', *The Lancet HIV*. Elsevier Ltd, 9(12), pp. e848–e856. doi: 10.1016/S2352-3018(22)00254-5.

Barré-Sinoussi, F., Ross, A. L. and Delfraissy, J. F. (2013) 'Past, present and future: 30 years of HIV research', *Nature Reviews Microbiology*, pp. 877–883. doi: 10.1038/nrmicro3132.

Davies, N.M. *et al.* (2018) 'The causal effects of education on health outcomes in the UK Biobank', *Nature Human Behaviour*, 2(2), pp. 117–125. Available at: https://doi.org/10.1038/S41562-017-0279-Y.

Duff, P. *et al.* (2010) 'Barriers to accessing highly active antiretroviral therapy by HIV-positive women attending an antenatal clinic in a regional hospital in western Uganda', *Journal of the International AIDS Society 2010 13:1*. BioMed Central, 13(1), pp. 1–9. doi: 10.1186/1758-2652-13-37.

Gandhi, R. T. *et al.* (2022) 'Antiretroviral Drugs for Treatment and Prevention of HIV Infection in Adults', *JAMA*. doi: 10.1001/jama.2022.22246.

Geldsetzer, P. *et al.* (2016) 'A systematic review of interventions to improve postpartum retention of women in PMTCT and ART care', *Journal of the International AIDS Society*. International AIDS Society. doi: 10.7448/IAS.19.1.20679.

Geldsetzer, P. *et al.* (2017) 'The impact of community health worker-led home delivery of antiretroviral therapy on virological suppression: a non-inferiority cluster-randomized health systems trial in Dar es Salaam, Tanzania', *BMC Health Services Research*. BioMed Central, 17(1). doi: 10.1186/s12913-017-2032-7.

Geldsetzer, P. *et al.* (2020) 'Willingness to pay for community delivery of antiretroviral treatment in urban Tanzania: A cross-sectional survey', *Health Policy and Planning*. Oxford University Press, 35(10), pp. 1300–1308. doi: 10.1093/heapol/czaa088.

Guidry, J. P. D. *et al.* (2021) 'Willingness to get the COVID-19 vaccine with and without emergency use authorization', *American Journal of Infection Control*. Mosby Inc., 49(2), pp. 137–142. doi: 10.1016/j.ajic.2020.11.018.

Hoke, T. *et al.* (2021) 'How Home Delivery

of Antiretroviral Drugs Ensured Uninterrupted HIV Treatment During COVID-19: Experiences From Indonesia, Laos, Nepal, and Nigeria', *Global Health Science and Practice*, 9(4), pp. 978–989. doi: 10.9745/GHSP-D-21-00168.

Jaffar, S. *et al.* (2009) 'Rates of virological failure in patients treated in a home-based versus a facility-based HIV-care model in Jinja, southeast Uganda: a cluster-randomised equivalence trial', *The Lancet*. Elsevier B.V., 374(9707), pp. 2080–2089. doi: 10.1016/S0140-6736(09)61674-3.

Javan-Noughabi, J. *et al.*(2017) 'Identification determinant factors on willingness to pay for health services in Iran', *Health Economics Review*. Springer Verlag, 7(1), p. 40. doi: 10.1186/s13561-017-0179-x.

Jiang, T. *et al.* (2022) 'Impact of the COVID-19 Pandemic on the UNAIDS Six 95% HIV Control Targets', *Frontiers in Medicine*. Frontiers Media S.A., 9, p. 191. doi: 10.3389/fmed.2022.818054.

Joseph, O. L. *et al.* (2022) '"When you have an immune disease like HIV and there is a pandemic, you still have to pay your bills": COVID-19-related challenges among people living with HIV and lessons for care delivery', *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV*. Routledge, 34(11), pp. 1405–1412. doi: 10.1080/09540121.2022.2067314.

Jürgensen, M. *et al.* (2013) 'Effects of home-based Voluntary Counselling and Testing on HIV-related stigma: Findings from a cluster-randomized trial in Zambia', *Social Science and Medicine*. Pergamon, 81, pp. 18–25. doi: 10.1016/j.socscimed.2013.01.011.

Mash, R. J. *et al.* (2022) 'Evaluating the implementation of home delivery of medication by community health workers during the COVID-19 pandemic in Cape Town, South Africa: a convergent mixed methods study', *BMC Health Services Research*. BioMed Central Ltd, 22(1), p. 98. doi: 10.1186/s12913-022-07464-x.

Mbachu, C. *et al.* (2018) 'Willingness to pay for antiretroviral drugs among HIV and AIDS clients in south-east Nigeria', *Health Expectations*. Blackwell Publishing Ltd, 21(1), pp. 270–278. doi: 10.1111/hex.12612.

Mirkuzie, A. H. *et al.* (2021) 'Progress towards the 2020 fast track HIV/AIDS reduction targets across ages in Ethiopia as compared to neighboring countries using global burden of diseases 2017 data', *BMC*

Public Health. BioMed Central Ltd, 21(1). doi: 10.1186/s12889-021-10269-y.

Mpofu, M. *et al.*(2021). Distribution of antiretroviral therapy through private pharmacies and postal courier services during COVID-19 in Botswana: acceptability and reach of two out-of-facility individual differentiated service delivery models. *Journal of the International AIDS Society*, *24 Suppl 6*(Suppl 6), e25814. https://doi.org/10.1002/jia2.25814

MSF (2013)*HIV/AIDS: Community models of care explained | MSF*. Available at: https://www.msf.org/hivaids-community-models-care-explained (Accessed: 18 July 2022).

NIH(2019) *'Initiation of Antiretroviral Therapy | NIH'*. Available at: https://clinicalinfo.hiv.gov/en/guidelines/hiv-clinical-guidelines-adult-and-adolescent-arv/initiation-antiretroviral-therapy (Accessed: 1 May 2023).

Nnenna, A. *et al.* (2022) 'Home Delivery of Antiretrovirals for HIV Clients amidst Covid-19 and Insecurity Challenges: A Protocol for a Randomized Controlled Trial'.

Office on Women Healht (2022) '*Women and HIV | Office on Women's Health*' . Available at: https://www.womenshealth.gov/hiv-and-aids/women-and-hiv (Accessed: 7 April 2023).

Onovo, A. A. *et al.*(2023) 'Estimation of HIV prevalence and burden in Nigeria: a Bayesian predictive modelling study', *eClinicalMedicine*. Elsevier Ltd, 62. doi: 10.1016/j.eclinm.2023.102098.

Ridgway, J. P. *et al.* (2020) 'HIV Care Continuum and COVID-19 Outcomes Among People Living with HIV During the COVID-19 Pandemic, Chicago, IL', *AIDS and Behavior*. Springer, pp. 2770–2772. doi: 10.1007/s10461-020-02905-2.

Sasu (2024) *'Demographics of Nigeria - statistics & facts | Statista*' . Available at: https://www.statista.com/topics/6477/demographics-of-nigeria/ (Accessed: 1 January 2024).

Santos, G. M. *et al.*(2022) 'Persistent disparities in COVID-19-associated impacts on HIV prevention and care among a global sample of sexual and gender minority individuals', *Global Public Health*. Routledge, 17(6), pp. 827–842. doi: 10.1080/17441692.2022.2063362.

Sanwo, O. *et al.* (2021) 'Differentiated service delivery models among PLHIV in Akwa Ibom and Cross River States, Nigeria during the COVID-19 pandemic: descriptive

analysis of programmatic data', *Journal of the International AIDS Society*. John Wiley and Sons Inc, 24(S6), p. e25820. doi: 10.1002/jia2.25820.

Semo, B. *et al.* (2023) 'Differentiated service delivery models for antiretroviral treatment refills in Northern Nigeria: Experiences of people living with HIV and health care providers–A qualitative study', *PLOS ONE*. Edited by L. S. Dulli. Public Library of Science, 18(7), p. e0287862. doi: 10.1371/journal.pone.0287862.

UNAIDS(2019)*'Moving towards the UNAIDS 90-90-90 targets*'. Available at: https://www.cdc.gov/globalhealth/stories/2019/moving-towards-unaids.html (Accessed: 24 November 2022).

UNAIDS (2022)*Full report — In Danger: UNAIDS Global AIDS Update 2022 | UNAIDS*. Available at: https://www.unaids.org/en/resources/documents/2022/in-danger-global-aids-update (Accessed: 28 December 2023).

UNAIDS (2023) *'Data on the size of the HIV epidemic*'. Available at: https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/data-on-the-size-of-the-hiv-aids-epidemic?lang=en (Accessed: 31 December 2023).

United Nations and Office of the United Nations High Commissioner for Human Rights(2007) *HIV/AIDS and human rights | OHCHR*. Available at: https://www.ohchr.org/en/health/hivaids-and-human-rights (Accessed: 1 May 2023).

Wanjala, S. W. *et al.*(2022) 'Measurement characteristics and correlates of HIV-related stigma among adults living with HIV: a cross-sectional study from coastal Kenya', *BMJ Open*. BMJ Publishing Group, 12(2). doi: 10.1136/bmjopen-2021-050709.

WHO (2010)*Health Equity -- Global*. Available at: https://www.who.int/health-topics/health-equity#tab=tab_1 (Accessed: 1 May 2023).

WHO (2023)*Human rights*. Available at: https://www.who.int/news-room/fact-sheets/detail/human-rights-and-health (Accessed: 1 May 2023).

Wilkinson, L. and Grimsrud, A. (2020) 'The time is now: expedited HIV differentiated service delivery during the COVID-19 pandemic', *Journal of the International AIDS Society*. John Wiley and Sons Inc., 23(5). doi: 10.1002/jia2.25503.

Zakumumpa, H. *et al.* (2021) 'Dispensing antiretrovirals during Covid-19 lockdown: re-discovering community-based ART delivery models in Uganda', *BMC Health Services Research*. BioMed Central Ltd, 21(1). doi: 10.1186/s12913-021-06607-w.