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Patients' Preferences for Antiretroviral Therapy Service in Northwest Ethiopia: A Discrete Choice Experiment

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Abstract

Objective. We aim to evaluate patients' preferences for antiretroviral therapy (ART) to enhance shared decision making in clinical practice in Northwest Ethiopia. **Methods.** A discrete choice experiment approach was used among adult patients from 36 randomly selected public health facilities from February 6, 2023, to March 29, 2023. A literature review, qualitative work, ranking and rating surveys, and expert consultation were used to identify the attributes. Location, provider, frequency of visit, appointment modality, refill time, and cost of visit were the 6 ART service features chosen. Participants were given the option of choosing between 2 hypothetical differentiated ART delivery models. Mixed logit and latent class analysis were used. **Results:** Four hundred fifty-six patients completed the choice task. Respondents preferred to receive ART refills alone at health facilities by health care workers without having to have frequent visits and with reduced cost of visit. Overall, the participants valued the cost of the visit the most while they valued the timing of ART refill the least. Participants were willing to pay only for the attributes of frequency of visit and medication refill time. The latent class model with 3 classes provided the best model fit. Location, cost, and frequency were the most important attributes in class 1, class 2, and class 3, respectively. Income and marital status significantly predicted class membership. **Conclusions.** Respondents preferred to receive refills at health facilities, less frequent visits, individual appointments, service provision by health care workers, and reduced cost of visit. The cost attribute had the greatest impact on the choice of patients. Health care workers should consider the preferences of patients while providing ART services to meet patients' expectations and choices.

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Highlights

- A discrete choice experiment was used to elicit patient preferences.
- People living with HIV preferred receiving medication refills at health facilities, less frequent visits, individual appointments, service delivery by health care workers, and lower visit costs.
- Health care workers should consider the preferences of patients while providing ART service to meet their expectations and choices.
- Scaling up differentiated HIV treatment services is crucial for patient-centered care.

Keywords
discrete choice experiment, human immunodeficiency virus, Northwest Ethiopia, patient, preference, treatment

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Introduction

The fundamental goal of human immunodeficiency virus (HIV) infection treatment is to increase survival, enhance quality of life, and limit HIV transmission by lowering the mortality and morbidity caused by the virus and associated diseases.[1] The Joint United Nations Programme on HIV/AIDS (UNAIDS) launched the "90-90-90" targets in 2014 with the goal of 90% of all individuals with HIV knowing this diagnosis, 90% of those diagnosed on treatment, and 90% of those on treatment achieving suppression of their virus.[2] HIV treatment services (antiretroviral therapy delivery) focus on the second and third targets.

Countries have embraced the use of person-centered, differentiated antiretroviral therapy delivery models to improve patient quality of care while minimizing the burden of HIV disease on health systems and maximizing the programmatic impact of HIV treatment.[3] In a recent systematic review and meta-analysis of randomized controlled trials in sub-Saharan Africa, differentiated service delivery (DSD) models were found to be comparably more effective than standard models of care (for both continuing care and attaining viral suppression) for stable people living with HIV (PLHIV).[4]

In Ethiopia, DSD models have been adopted at different times. By October 2016, the country had started implementing an appointment spacing model (ASM).[5] The Health Extension Professional-led Community ART Refill Distribution Group (HEP-CAG) has been piloted in Addis Ababa and Gambella since 2018. By early 2020, fast-track ART refill (FTAR) had been implemented. By late 2020, the Peer-led Community ART Refill Distribution Group (PCAD) started to be implemented.[6] The ASM (6-mo refill) and FTAR (3-mo refill) are facility-based individual models led by health care workers, whereas HEP-CAG and PCAD are health extension professional and client-managed group models, respectively, where the ART refill takes place every 3 mo at the community level.

In February 2022, the DSD models were classified as less intensive or more intensive. The less intensive DSD models are those individual and group models intended for clients who are established on ART. These include both facility and community-based approaches. These types of models require less frequent clinic visits and focus on the education and empowerment of clients. The models under this category include the appointment spacing model (ASM/6MMD), 3 mo ARV dispensing

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(3MMD), fast-track ARV drugs refill model, health extension professional managed community ART refill group (HEP_CAG), and peer-led community-based ART distribution/group (PCAD/G).[7] More intensive DSD models, on the other hand, are intended for clients who need close follow-up and frequent clinic visits. These include clients with opportunistic infection, unsuppressed viral load, adolescents, pregnant women, and those with psychosocial barriers to adherence and retention. The models under this category include the health care worker-managed DSD model for adolescents living with HIV (DSD for ALHIV), DSD for key populations (for female sexual workers), DSD for Maternal and Child Health, and DSD for advanced HIV disease and PLHIV at high-risk disease progression.[7]

The International AIDS Society recommends a 5-step approach that aids in the planning of how to differentiate HIV treatment programs for ministries of health, supporting partners, and communities. These steps include 1) assessing ART data, policies, and delivery; 2) defining challenges; 3) defining for whom HIV treatment will be differentiated; 4) building a model of differentiated HIV treatment; and 5) considering additional adaptations that can be made to differentiate HIV treatment further. Assessing the patients' preferences is an important step to identify the challenges that can be addressed through differentiated HIV treatment delivery.[8] Research is required to better understand client preferences regarding the age, population, and setting at which to begin antiretroviral therapy (ART).[3]

Provision of HIV treatment through DSD models requires resources, which, if not well aligned with patient preferences, could lead to underutilization, waste, and inefficient provision of services.[9] Understanding patients' preferences can provide crucial insights to improve their adherence to treatment, retention in care, and viral suppression. One effective way to increase the adoption and consistent use of antiretroviral therapy is by customizing its treatment components to meet the specific needs of the target population.[10,11] The discrete choice experiment (DCE) is a stated preference evaluation technique that is widely used to elicit patient preferences. In this approach, patients are asked to tradeoff different attributes of health care services.[12,13] Previous DCE-based studies on HIV treatment service have reported that patients valued getting care at a health facility,[9,14–17] from health care workers rather than other service providers,[14,16] individual appointments,[9,14,16,17] less frequent visits,[9,14–18] less waiting time,[9,15,17–19] buddy ART collection,[15] nice providers,[9,16–19] facilities that were nearer to their residence,[11,18,20,21] nonbranding of the HIV clinic,[19] and lower service cost.[9,11,17,19–21] It is uncertain how applicable the results of preference studies are to different countries. Factors such as variations in socioeconomic status, culture, and health care system capabilities can affect patient preferences and limit the generalizability of the findings to other contexts, such as Ethiopia. The available preference studies related to HIV treatment service have limitations. First, previous studies based their findings on selecting participants from a single center or limited areas or public health facilities only, affecting the generalizability of their findings. Second, most previous studies were performed using a small patient sample size, which could affect the power of the study, limiting accurate parameter estimations. Third, the previous studies lack a rigorous approach to selecting the final list of attributes of HIV treatment service. The studies were done based on a literature review, expert opinion, and qualitative work. The studies did not consider ranking and rating surveys, which are recommended in discrete choice experiments to generate the final list of attributes.[22] Therefore, this study aimed to evaluate adult patients' preferences for HIV treatment service characteristics in Northwest Ethiopia. The results of the DCE in this study may help guide clinical and policy decisions about HIV treatments that are tailored to the needs of HIV patients in Ethiopia. Since tailoring treatment components to individual needs maximizes the long-term use of an intervention, the study's findings may contribute to improving therapy adherence, which could ultimately lower AIDS-related morbidity and mortality and improve patients' quality of life.

Methods

Study Design and Setting

A cross-sectional discrete choice experiment (DCE) was conducted. The study was conducted in 4 areas (Awi, East Gojjam, and West Gojjam zones, and Bahir Dar City administration) in Northwest Ethiopia. There are 3 comprehensive specialized hospitals, 3 general hospitals, 18 primary hospitals, and 76 health centers providing ART services in these settings. The study was conducted from February 6, 2023, to March 29, 2023.

Study Population, Sample Size, and Sampling Procedure

The study populations were all outpatient HIV-positive patients aged 18 y and older in the less intensive DSD models at 36 randomly selected ART sites (public hospitals [3 comprehensive specialized, 1 general, and 8

primary] and 24 health centers) in the 3 zones and 1 city administration. The sample size was determined using the sample size formula for discrete choice models[23,24]:

$$\frac{n \geq Z^2 q}{rpd^2}$$

where p is the choice share; z is the level of statistical significance; q is failure in choice share, $q = 1 - p$; r is the number of replications; and d is the allowable margin of error. The choice share p for a particular preference is the share of a single attribute over the total attributes. Our study involves 6 attributes, and the probability p for each attribute is 1/6. However, since the population is heterogeneous, the values of p and q are 0.167 and 0.833, respectively. Our objective was to achieve a 95% confidence level in our result with a 5% margin of error, for which we used $z = 1.96$. We conducted 36 replications of the fractional factorial design ($r = 36$) in our experiment. To account for the sampling variance across health facilities in the study settings, we used a design effect value of 2. The 10% nonresponse rate was taken into account. The final required sample size was 469. Participants were chosen via consecutive sampling technique from a proportionally allocated sample in each health facility.

Identification of Attributes and Levels

In this study, the selection of attributes and assignment of their levels were performed based on a combination of literature review, qualitative work, ranking and rating surveys, and expert consultation. First, conceptual features of antiretroviral therapy were identified through a systematic review[25] and scoping review.[26] We used mixed quantitative and qualitative methods in our systematic review. We searched multiple databases, including Web of Science, Embase, CINAHL, PubMed, Google, and Google Scholar. Details about our search approach, data extraction, and outcomes can be found elsewhere.[25] We also conducted a comprehensive scoping review using Google, Google Scholar, and various databases including PubMed, Web of Science Core Collection, Embase, Scopus, CINAHL, and Global Health. Data, and outcomes are available elsewhere.[26]

Second, a qualitative study was conducted to uncover the context-specific features. The data collection instrument for the qualitative study was designed based on conceptual attributes and their potential levels identified in the first step. Fifteen in-depth interviews with purposively selected stable adult (≥18 y old) patients on ART who were eligible for the DSD during the data collection date were conducted.[27]

Third, ranking and rating surveys were conducted from July 1, 2022, to July 25, 2022, on 23 attributes identified by the literature review and qualitative study. A ranking survey among 31 HIV/AIDS program implementers in Ethiopia was undertaken to rank the importance (from most [1] to least [23]) of factors influencing the decision to receive ART service. A questionnaire was sent via e-mail, including the survey's purpose, methodology, and instructions. Additional clarifications were made via phone and e-mail. We also surveyed 35 patients in ART clinics in Bahir Dar City administration, East and West Gojjam, and Awi zones. They rated 23 factors influencing their ART service choices on a scale of 1 to 7, where 1 = *Attribute is not at all important* and 7 = *Attribute is highly important*. Participants in the ranking and rating surveys were given a list of 23 attributes. An Excel spreadsheet was used to calculate the individual overall mean scores for each attribute in both surveys.

Fourth, the attributes and levels determined in the earlier phases were then evaluated by experts. We had a team of 8 experts with various backgrounds (1 general practioner working at the ART clinics of a tertiary hospital, a degree nurse who could prescribe ARV drugs, a pharmacist who dispensed ARV drugs, a national HIV/AIDS program coordinator, 2 public health professionals with master's degrees with expertise in discrete choice experiments, and a PhD holder in reproductive health with extensive HIV/AIDS research experience).

Finally, the research team selected the 6 attributes with their levels by conducting 2 meetings. Table 1 contains a complete list of the 6 attributes and the corresponding levels.

Experimental Design and Construction of Choice Sets

An orthogonal design was generated using Ngene software version 1.3. Desirable design criteria were taken into account in the experimental design: minimum overlap (minimize the overlap of levels for each attribute in each choice), level balance (levels of each attribute appear equally often), orthogonality (attribute levels appear in choice sets with equal frequency with each level of each other attribute), and utility balance (options in each choice set have similar probabilities of being chosen).[22] A generic or unlabeled type of binary choice set was developed. The options in the scenarios were differentiated service delivery 1 (DSD1) and differentiated service delivery 2 (DSD2). An opt-out option was not included since

Table 1 The 6 Attributes and Their Corresponding Levels

Attribute	Definition	Level
Location of ART refills	Location where ART refills are provided	Health facility (health center, hospital) Community Home
Frequency of receiving ART refills	Frequency of regular visits (examples, for patients who feel well, with no new symptoms or concerns that require an irregular visit or consultation)	Monthly Every 3 mo Every 6 mo
Person providing ART refills	The person who delivers ART refills (counseling, symptom screening, adherence assessment, and/or ARV distribution)	Health care provider Health extension worker Experienced HIV patient
Participants/others appointed at same ART refill visit	Individual appointment versus an appointment that includes other patients on ART or family members	Individual Group
Medication refill pick up/ delivery times	Days and times antiretroviral (ARV) medication refill are provided	Monday–Friday only (8:30 AM–5:30 PM) Monday–Friday (8:30 AM–5:30 PM) plus early morning hours (opens at 6 AM) Monday–Friday (8:30 AM–5:30 PM) plus evening hours (open until 8 PM) Monday–Friday (8:30 AM–5:30 PM) plus Saturday and Sunday
Total cost of visit during ARV medication refill	Total cost, including transportation, direct medical costs (e.g., non-ARV drug costs)	Free 250 birr 500 birr

ART, antiretroviral therapy; ARV, antiretroviral.

respondents may choose the opt-out option to avoid making a difficult choice. In addition, allowing respondents to select an opt-out option would provide less information on respondents' relative preferences for the attributes in the hypothetical alternatives.[22]

Overall, 36 choice sets were generated and blocked into 3 survey versions (12 choice tasks for each) to promote response efficiency by reducing the necessary cognitive effort for each respondent who completes the survey.[28–30] Each block represented a separate survey, and participants were randomly assigned to 1 of the 3 survey versions. Such heterogeneous design allowed for more variation in the attribute levels, resulting in a larger amount of information on the respondents' preferences.[31–34] For each choice task, respondents were asked to choose between 2 hypothetical service delivery scenarios. Figure 1 illustrates a choice set as an example.

Development of the Questionnaire, Pretesting, and Data Collection

The research team first developed an English-language structured questionnaire. The final version of the English questionnaire was translated into Amharic (the local language in the area where the study was conducted). The Amharic version of the instrument was then back translated into English to ensure contextual preservation. The research team evaluated the tool's face validity and clarity. The questionnaire consists of an introduction, the main choice questions, and the sociodemographic characteristics of the respondents (Supplemental Material). Each respondent was asked only 12 choice tasks in total. In addition, we included a warm-up question that allows the respondents to become familiarized with the policy under examination and to comprehend better the choice sets.[35] We created laminated documents that included the introduction, warm-up, and main choice questions for the 3 blocks, with each choice card displayed on a single page. During each interview, data collectors consulted a laminated document. Respondents were asked to imagine they were deciding which service delivery approach to take. They were asked to choose between DSD1 and DSD2 based on the 6 different attributes of ART service provision.

The Kobo Toolbox online platform (https://ee.kobotoolbox.org/x/xX2pvjiD) was used for field data

Question 1

Attributes	DSD 1	DSD2
Location of ART refills	Home	Community
Frequency of receiving ART refills	Every six months	Every three months
Person providing ART refills	Experienced HIV patient	Health extension worker
Participants/others appointed at same ART refill visit	Individual	Individual
Medication refill pick up/delivery times	Monday-Friday(8:30 AM-5:30 PM) plus evening hours (open until 8 PM)	Monday-Friday(8:30 AM-5:30 PM) plus early morning hours (opens at 6 AM)
Total cost of visit during ARVmedication refill	250 Birr	500 Birr
Which of the two treatments best represent your preferences? (Tick one box only)	☐	☐

Figure 1 An illustration of a choice task in English.
ART, antiretroviral therapy; ARV, antiretroviral; DSD, differentiated service delivery.

collection. A pretest was done among 24 purposively selected adult patients in the less intensive DSD models at Woldia General Hospital, Muja and Mersa health centers in North Wollo zone. The pretest aimed to explore the respondents' understanding of the choice task, the clarity of the attributes and levels, and their feedback about the exercise. Two days of training was given to the 5 data collectors and 1 supervisor.

Data Management and Analysis

Data collected via the Kobo Toolbox platform were exported in CSV form. The wide data were transformed into the long format. Then data were exported into STATA 17.0 for labeling and analysis. Dummy coding was used to describe the categorical variables of attribute levels, except cost, which was specified as continuous. loc_hf, loc_com, loc_home: dummy variable levels for the location attribute; freq_1, freq_2, freq_3: dummy variable levels for the frequency attribute; person_hcw, person _hew, person client: dummy variable levels for the provider attribute; appoin_ind, appoin_gro: dummy variable levels for appointment attribute; and refilltim_usu, refilltim_usu_mor, refilltim_usu_eve, refilltim_usu_wkd for refill time attribute. The cost attribute underwent testing for linearity using the Box-Tidwell transformation before being considered as a continuous variable.[36–38] The *P* value for the transformed cost variable was 0.175, which was not statistically significant, and this showed the linearity of the cost attribute.

We performed regression analyses to assess patient preferences for DSD attributes. Models were used to determine preference weights (b coefficients), which represent the strength of preferences for a level compared with the reference level. Positive values indicate positive preferences, negative values indicate negative preferences, and higher b values signify stronger preferences.

Mixed logit was used to account for the heterogeneity of preferences across the population. This overcomes the limitations of the conditional logit model (assumes respondents have the same preference, when in reality, they might have unique personal preferences). The main effects mixed logit model is presented as follows:

$$\begin{aligned} V = {} & \beta 1\text{cost} + \beta 2\text{loc\_com} + \beta 3\text{loc\_home} + \beta 4\text{freq\_2} \\ & + \beta 5\text{freq\_3} + \beta 6\text{person\_hew} + \beta 7\text{person client} \\ & + \beta 8\text{appoin\_gro} + \beta 9\text{refilltim\_usu\_mor} \\ & + \beta 10\text{refilltim\_usu\_eve} + \beta 11\text{refilltim\_usu\_wkd} \\ & + \beta 12\text{const} + \varepsilon \end{aligned}$$

where V = total utility, β1–β11 = coefficients of the attributes, and ε = the random error term.

The goodness of fit of the mixed logit model for the data was checked with a likelihood ratio chi-square test. We conducted a willingness-to-pay (WTP) analysis to

determine how much patients are willing to pay for each ART service attribute. We calculated WTP by dividing the negative of the β coefficient for other attributes by the β coefficient of the cost attribute, which we found using the mixed logit model. The WTP estimates and 95% confidence intervals were calculated using the "nlcom" command in STATA. During data collection, the exchange rate was 1 USD (United States dollar) = 53.525 ETB (Ethiopian birr).

Latent-class analysis was conducted to account for the unobserved preference variation by using the data to identify groups of respondents with similar preferences. Each respondent was assumed to belong to a class k, where preferences vary across, but not within, classes. The Akaike information criterion (AIC) and the Bayesian information criterion (BIC) were used to determine the ideal number of classes (lower values indicate a better model fit). We continued to run models with 1 extra class at a time until we found the best model (that which resulted in the minimum value). In addition, the highest posterior probability of class membership was calculated (as the average over respondents) to assess how well the model differentiates among various classes of preferences. We used sociodemographic variables (gender, age, residence, education, marital status, income, duration on ART service) and health facility type as regressors to assess their impact on class membership. To carry out this analysis, lclogit2 and lclogitml2 were used.[39]

Relative importance scores for the attributes included were calculated for both the mixed logit model and latent class model using a range method to determine the relative impact of the attributes on the decision of respondents. First, the range for each attribute was calculated by subtracting the lowest and highest coefficients for attribute levels of the same attribute. For the cost attribute, we calculated the coefficients for the discrete levels as presented to participants in the choice experiment. For example, the utility (coefficient) for total cost of visit was −0.003, and the levels presented in the experiment were 0 birr, 250 birr, and 500 birr; if we set the default level at 0 birr, the 0 birr coefficient would be (0) × (−0.003) = 0. The relative utility for 250 birr as compared with that for 0 birr would be (250 − 0) × (−0.003) = −0.75. The relative utility for 500 birr as compared with that for 0 birr would be (500 − 0) × (−0.003) = −1.5. The range would be 0 − (−1.5) = 1.5. Second, to calculate the overall total of all ranges, we added the ranges of each attribute already obtained in the first step. Then, we calculated the relative impact of each attribute by multiplying the ratio between each attribute's range and the sum of all ranges by 100.[35,36,40–42]

Results

Sociodemographic Characteristics of Participants

In total, 456 patients participated in this study, resulting in a response rate of 97.2%. The median age of the respondents was 40 y (interquartile range: 12 y). More than two-thirds (67.8%) of the patients were females. Most were from urban areas (79.2%). The participants' duration on ART ranged from a half year to 26.5 y. Nearly half of the patients were enrolled in the appointment-spacing mode (47.1%). Six of 10 participants were health center–based clients (60.8%; Table 2).

Mixed Logit Model

The results of the mixed logit regression model showed that 5 attributes, namely, location, frequency, provider type, appointment, and cost, had a statistically significant impact on the participants' choice, whereas the timing of ART refill was found to be statistically insignificant. Patients were less interested in ART refill in the community (β = −0.735 [−0.914, −0.556]) or at home (β = −0.551 [−0.709, −0.393]), in contrast to refill at a heath facility. Respondents had a positive preference for the frequency of visit every 3 mo (β = 0.446 [0.340, 0.552]) or every 6 mo (β = 0.615 [0.494, 0.736]) relative to a monthly visit. Compared with health care workers, patients had a lower preference for health extension workers (β = −0.453 [−0.596, −0.309]) or experienced HIV clients (β = −0.327 [−0.445, −0.208]). Participants had lower preference for a group-based appointment for ART refill (β = −0.179 [−0.278, −0.081]) than individual appointment. For a unit increase in the cost of a visit in Ethiopian birr, the probability of the patient's preference for antiretroviral therapy refill service decreased by a z-score of 0.003 (β = −0.003 [−0.004, −0.002]; Table 3).

Willingness to Pay

Table 4 reports the WTP estimate based on the mixed logit model results. Respondents were willing to pay up to 145.902 ETB and 201.03 ETB for a frequency of ART refills of every 3 mo and 6 mo, respectively, instead of a monthly visit. The negative (−) results show the maximum compensation patients were willing to accept for a specific attribute. Patients would like to be compensated 240.203 ETB and 180.173 ETB to accept community and home locations, respectively, compared with health facility refill. Participants would like to be compensated 147.923 ETB and 106.8 ETB to accept ART refill by

Table 2 Sociodemographic Characteristics of Participants in Northwest Ethiopia, 2023 ($N = 456$)

Characteristic	*n*	%
Gender		
Male	147	32.2
Female	309	67.8
Age, y	Median: 40 (interquartile range:12)	
Residence		
Urban	361	79.2
Rural	95	20.8
Educational level		
No education	172	37.7
Primary	136	29.8
Secondary and higher	148	32.5
Marital status		
Never married	55	12.1
Married	223	48.9
Divorced	122	26.8
Widowed	56	12.3
Occupation		
Unemployed	63	13.8
Unskilled employment	266	58.3
Skilled employment	127	27.9
Monthly income in birr	Median: 2,000 (interquartile range: 2,800)	
Health facility type		
Health center	277	60.8
Primary hospital	48	10.5
General hospital	78	17.1
Tertiary hospital	53	11.6
Enrollment status in DSD models		
Multimonth dispensing (MMD)	193	42.3
Appointment spacing model (ASM)	215	47.1
Fast-track ART refill (FTAR)	30	6.6
Health extension professional-led community antiretroviral refill distribution (HEP-CAG)	8	1.8
Peer-led community antiretroviral distribution (PCAD)	3	0.7
DSD for adolescents (those 18–19 y only)	7	1.5
Duration on ART, y	Range (0.5, 26.5)	

ART, antiretroviral therapy.

health extension workers and experienced HIV patients, respectively, rather than refill by health care workers. A compensation of 58.58 ETB was required for patients to accept a group-based appointment instead of an individual appointment for ART refill. The medication refill delivery time attribute did not have a significant impact on the willingness-to-pay measure (Table 4).

Latent Class Model

Based on the information criteria (AIC and BIC), the latent class model with 3 classes provided the best model fit. The model had a strong predictive ability, predicting class membership with up to 87.08% certainty. Based on the class probabilities, 46.9% of the observations were assigned in class 1, 37.5% were assigned in class 2, and 15.6% were assigned in class 3. All respondents from the 3 classes showed a preference for lower cost of ART refill service. Class 1 and class 3 were less interested in ART refill at a community center or at home in contrast to refill at a health facility. Class 1 and 3 had less preference for the group appointment over the individual appointment. Class 2 and 3 preferred visits every 3 or 6 mo compared with monthly health facility visits. Class 1 had lower preference for an experienced HIV client than for health care workers. Class 2 had lower preference for health extension workers or experienced HIV clients compared with health care workers. The results showed that

Table 3 Respondents' Preference for Antiretroviral Therapy, Main Effects Mixed Logit Model ($N = 456$)

Variable	Coefficient (95% CI)	SE	*P* Value	*s*	SE (*s*)	*P* Value
Location of ART refills						
Health facility	Reference					
Community	−0.735 (−0.914, −0.556)	0.0913	<0.001	0.4773	0.1242	<0.001
Home	−0.551 (−0.709, − 0.393)	0.0807	<0.001	0.6486	0.0906	<0.001
Frequency of ART refills						
Every month	Reference					
Every 3 mo	0.446 (0.340, 0.552)	0.0541	<0.001	−0.0013	0.1014	0.99
Every 6 mo	0.615 (0.494, 0.736)	0.0618	<0.001	0.4544	0.0896	<0.001
Person providing ART refills						
Health care provider	Reference					
Health extension worker	−0.453 (−0.596, −0.309)	0.0734	<0.001	0.2610	0.1946	0.180
Experienced HIV patient	−0.327 (−0.445, −0.208)	0.0604	<0.001	0.4592	0.0905	<0.001
Participants/others appointed at same ART refill visit						
Individual	Reference					
Group	−0.179 (−0.278, −0.081)	0.0502	<0.001	0.3157	0.1146	0.006
Medication refill pick up/delivery times						
Monday–Friday only (8:30 AM–5:30 PM)	Reference					
Monday–Friday (8:30 AM–5:30 PM) plus early morning hours (opens at 6 AM)	−0.011 (−0.135, 0.113)	0.0632	0.87	−0.0039	0.1347	0.98
Monday–Friday (8:30 AM–5:30 PM) plus evening hours (open until 8 PM)	−0.068 (−0.227, 0.090)	0.0810	0.40	−0.0578	0.4622	0.90
Monday–Friday (8:30 AM–5:30 PM) plus Saturday and Sunday	0.077 (−0.066, 0. 220)	0.0729	0.29	0.2819	0.1393	0.043
Total cost of visit during antiretroviral (ARV) medication refill	−0.003 (−0.004, −0.002)	0.0001	<0.001	—	—	—
Constant	−0.017 (−0.080, 0.045)	0.0317	0.58	—	—	—

ART, antiretroviral therapy; ARV, antiretroviral; s, standard deviation; SE, standard error.
Number of obs = 10,940; LR chi2 (10) = 53.84; Prob > chi2 = 0.0000; log likelihood = −3,327.8498.

marital status and income significantly predicted class membership. Compared with class 3, class 1 and class 2 respondents had lower monthly income. In comparison with class 3, class 1 participants were not currently married. Gender, residence, age, education, health facility type, and duration since starting ART service were not significantly associated with class membership (Table 5).

Relative Importance of Attributes

Figure 2 shows the relative importance of attributes from mixed logit and latent class analyses. Overall, the participants put the highest value on the cost of the visit (relative importance score of 42.15%). The least value was given to the timing of ART refill (relative importance score of 2.16%). The attributes location, cost, and frequency were the most important attributes in class 1, class 2, and class 3, respectively.

Discussion

To the best of our knowledge, this study is the first to use a discrete choice experiment to evaluate and quantify patients' preferences for service delivery for antiretroviral therapy in Ethiopia.

Patients valued less frequent facility visits (every 3 and 6 mo) for ART refills compared with monthly visits. This finding is in line with previous studies in Kenya,[14,16] Zambia,[15,18] and Zimbabwe.[9,17] A qualitative study in Ethiopia also revealed that most patients chose to get ART refill every 6 mo.[27] This has programmatic

Table 4 Respondents' Willingness to Pay (WTP) for Attributes of Antiretroviral Therapy in Northwest Ethiopia ($N = 456$)

Variable	WTP (95% CI)	SE	*P* Value
Location of ART refills			
Health facility	Reference		
Community	−240.203 (−298.787, −181.619)	29.890	<0.001
Home	−180.173 (−230.236, −130.109)	25.543	<0.001
Frequency of ART refills			
Every month	Reference		
Every 3 mo	145.902 (111.129, 180.676)	17.742	<0.001
Every 6 mo	201.030 (160.616, 241.445)	20.620	<0.001
Person providing ART refills			
Health care provider	Reference		
Health extension worker	−147.923 (−193.844, −102.001)	23.429	<0.001
Experienced HIV patient	−106.800 (−145.593, −68.006)	19.793	<0.001
Participant's appointment on ART refill visit			
Individual	Reference		
Group	−58.580 (−90.552, −26.608)	16.313	<0.001
Medication refill pick up/delivery time			
Monday–Friday only (8:30 AM–5:30 PM)	Reference		
Monday–Friday (8:30 AM–5:30 PM) plus early morning hours (opens at 6 AM)	−3.505 (−43.989, 36.979)	20.655	0.87
Monday–Friday (8:30 AM–5:30 PM) plus evening hours (open until 8 PM)	−22.239 (−73.960, 29.481)	26.388	0.40
Monday–Friday (8:30 AM–5:30 PM) plus Saturday and Sunday	25.093 (−21.839, 72.026)	23.946	0.30

ART, antiretroviral therapy; SE, standard error; WTP, willingness to pay.

implications for implementing a longer interval of health facility visits in ART service provision.

In this study, patients showed less preference for community- and home-based ART refill locations compared with health facility–based ART refill. Similar studies conducted elsewhere[9,14–17] also found that patients valued service provision at a health facility. Concerns regarding confidentiality, obtaining health investigations, and receiving prompt and effective services were the major issues for health facility service preference, as shown by a qualitative study in Ethiopia.[27] Another qualitative study in Nigeria, however, found a different result regarding a home delivery alternative, whereby PLHIV indicated a preference for a model of home delivery of ART to alleviate potential stigma and discrimination.[43] A program-based study of client preference among PLHIVs enrolled in the community DSD models in Ethiopia also showed that most clients preferred peer-led ART distribution (PCAD) to health extension professional–managed ART refill (HEP_CAG).[44]

With regard to provider type, patients had less preference for health extension workers and experienced HIV patients compared with health care workers at the health facilities. The existing evidence also shows that patients valued health care workers more than other provider types.[14,16,27] This has important implications for demand creation by HIV program implementers to raise awareness about the availability of alternative service providers. According to World Health Organization recommendations, community health workers, including PLHIV, should take up the duty of providing HIV services at the community level from doctors and nurses at the health facilities.[45]

Patients also had less interest in group-based appointments for ART refills. This is also supported by studies conducted in Kenya[14,16] and Zimbabwe[9,17] in which patients valued the individual-based approach more. Participants in a previous qualitative study conducted in Ethiopia found reasons for the need to maintain privacy and confidentiality, avoid clashing with other group members, weight checkups, fear of drug change, and getting appropriate service.[27] This has a significant implication on the global goal of reducing stigma and discrimination in Ethiopia.

Patients placed more value on the reduced cost of visits. This is in line with the existing studies undertaken in South Africa,[19] Zimbabwe,[9,17] and Colombia.[11,20,21] A qualitative study in Ethiopia similarly reported that participants chose free or subsidized visit cost for an ART refill service.[27] Overall, in the current study, patients put the greatest importance on the cost of the visit. This is in line with a previous synthetic review that reported that people living with HIV in low- and middle-income countries ranked cost as the most important factor when considering HIV services, with 11 of 13 attribute

Table 5 Latent Class Logit Model

Attribute	Level	Class 1 β Coefficient	SE	*P* Value	Class 2 β Coefficient	SE	*P* Value	Class 3 β Coefficient	SE	*P* Value
Location of ART refills	Health facility	Reference								
	Community	−0.6877	0.1272	<0.001	−0.1727	0.2500	0.49	−1.9669	0.4717	<0.001
	Home	−0.5534	0.1122	<0.001	−0.3016	0.2180	0.167	−1.1499	0.2978	<0.001
Frequency of ART refills	Every month	Reference								
	Every 3 mo	0.0662	0.0787	0.40	0.5205	0.1684	0.002	2.0436	0.4132	<0.001
	Every 6 months	0.0747	0.0955	0.43	0.9199	0.1767	<0.001	3.1312	0.5982	<0.001
Person providing ART refills	Healthcare provider	Reference								
	Health extension worker	−0.1468	0.1016	0.148	−0.8597	0.2154	<0.001	−0.6019	0.3244	0.064
	Experienced HIV patient	−0.2709	0.0831	0.001	−0.6554	0.1820	<0.001	0.3226	0.2521	0.20
Participants/others appointed at same ART refill visit	Individual	Reference								
	Group	−0.1690	0.0660	0.010	−0.0490	0.1243	0.69	−0.6783	0.2117	0.001
Medication refill pick up/ delivery times	Monday–Friday only (8:30 AM–5:30 PM)	Reference								
	Monday–Friday(8:30 AM–5:30 PM) plus early morning hours (opens at 6 AM)	−0.0611	0.0856	0.48	0.2545	0.1782	0.153	−0.1290	0.2611	0.62
	Monday–Friday(8:30 AM–5:30 PM) plus evening hours (open until 8 PM)	−0.0054	0.1145	0.96	0.0483	0.2112	0.82	−0.0107	0.3439	0.98
	Monday–Friday(8:30 AM–5:30 PM) plus Saturday and Sunday	0.1160	0.0994	0.180	0.2306	0.2098	0.27	−0.2338	0.2722	0.39
Total cost of visit	—	−0.0008	0.0002	<0.001	−0.0080	0.0005	<0.01	−0.0025	0.0005	<0.001
Class share		46.9%			37.5%			15.6%		
Class membership model parameters										
Gender: Reference (male)		0.1368	0.4323	0.75	−0.1678	0.4275	0.70	Reference		
Residence: Reference (rural)		0.6225	0.5070	0.22	0.8607	0.5044	0.088	Reference		
Age		0.3040	0.3810	0.60	0.4011	0.7606	0.25	Reference		
Education: Reference (no formal education)		0.3807	0.4985	0.45	0.0291	0.4939	0.95	Reference		
Marital status: Reference (not married)		−0.9977	0.4881	0.041	−0.6696	0.4871	0.169	Reference		
Health facility type: Reference (hospital)		−0.027	0.2019	0.84	−0.096	0.037	0.42	Reference		
Duration since starting ART service		−0.06124	0.0446	0.170	−0.0387	0.0449	0.39	Reference		
Own monthly income		−0.0001	0.0001	0.036	−0.0002	0.0001	0.001	Reference		
Constant		0.0451	0.0444	0.31	−0.0246	0.0809	0.76	Reference		

ART, antiretroviral therapy; SE, standard error.

AIC = 6,384.5176; BIC = 6,541.1723; mean highest posterior probability = 87.08%.

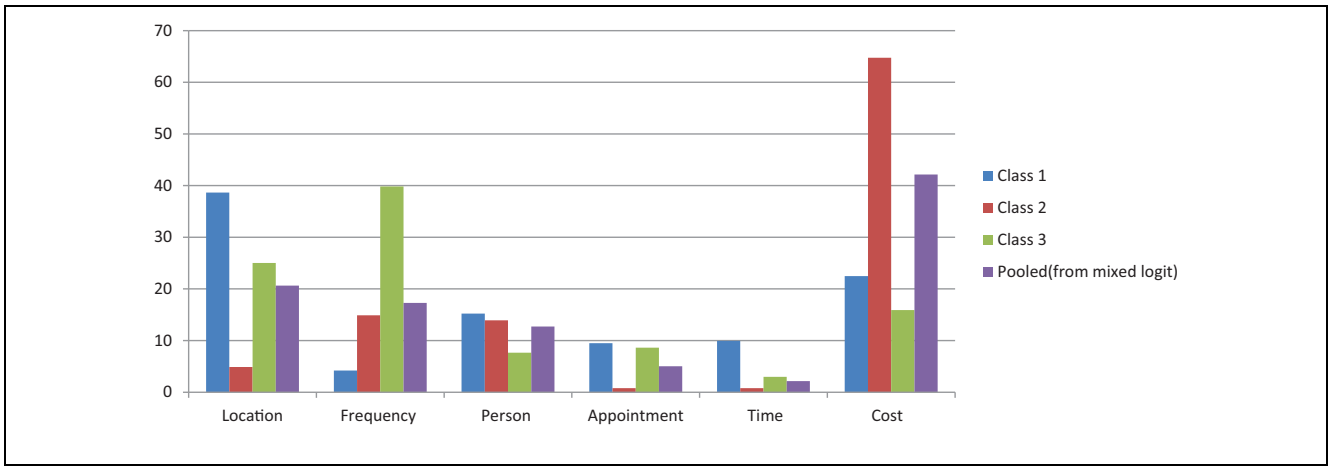

Figure 2 Relative importance of attributes on mixed logit and latent class analyses in Northwest Ethiopia, 2023.

comparisons listing cost as the top priority.[40] Continued effort is needed to promote the implementation and scale up of DSD models so that patients can obtain medication closer to home, reducing trips to health facilities and decreasing the cost of the visit.

In the latent class analysis, the 3 latent classes (groups) showed that the relative importance scores for the study's attributes differed. Location, cost, and frequency were the most important attributes in class 1, class 2, and class 3, respectively. This highlights that interventions targeting groups of patient populations can enable more effective and tailored strategies for improving HIV treatment service.

Limitations

The study was conducted in both urban and rural areas as well as multiple health facilities including health centers and hospitals (primary, general, and tertiary), which could enhance the generalizability of the findings in Northwest Ethiopia. However, this study had limitations. First, stratified analysis by the health facility that offers both community- and facility-based ART models versus a health facility that implements only facility-based ART models was not done due to the small sample size of the former type of health facilities. Second, since the discrete choice experiment was based on selected attributes, the assessment was not conducted for all potential characteristics of the ART service, which limits the appropriate prediction of patients' behavior. Third, because the study was done cross-sectionally, patients' preferences over time were not assessed. Fourth, the findings from the current discrete choice experiment study may not have direct generalizability for contexts other than Ethiopia.

Conclusions

In this study, respondents preferred receiving ART services at health facilities, less frequent visits, individual appointments, service provision by health care workers, and reduced cost of visits. The cost of visit had the greatest impact on the patients' choice. Latent class analysis revealed that preferences were not uniform. Hence, health care workers should consider the preferences of patients while providing ART service to meet their expectations and choices. Scaling up differentiated HIV treatment services is crucial for patient-centered care.

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Author Contributions

All authors engaged in the conception, design, and development of the data collection tool. FAT developed the experimental design. MY, AA, and FAT supervised the data collection. YAB and FAT analyzed the data. YAB drafted the manuscript. Feedback and editing were provided by MY, AA, and FAT. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

This study received ethical approval from the University of Gondar's Institutional Review Board (approval No. V/P/RCS/

05/762/2021), and formal permission from the Amhara Public Health Institute was obtained to conduct the study at health facilities located within the region. Participants provided written informed consent to participate in interviews.

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Data Availability

The datasets used during the current study are available from the corresponding author upon reasonable request.

Supplemental Material

Supplementary material for this article is available online at https://doi.org/10.1177/23814683241273635.

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