

Research Article

Assessment of Voluntary Enrollment and Associated Factors in Community-based Health Insurance in Lideta Sub-city, Addis Ababa, Ethiopia

Mohammed Hassan¹, Abebe Derbie² , Asefa Taresa^{3,*}, Dawit Regasa⁴

¹Lideta Sub City Health Office, Addis Ababa, Ethiopia

²College of Business and Economics, Addis Ababa University, Addis Ababa, Ethiopia

³School of Public Health, Menelik II Medical and Health Science College, Addis Ababa, Ethiopia

⁴School of Public Health, Jimma University, Jimma, Ethiopia

Abstract

Background: A community-based health insurance scheme is an effective way to achieve universal health service coverage by offering financial protection against healthcare costs. This study aimed to assess the voluntary enrollment and associated factors in community-based health insurance in the Lideta sub-city. **Methods:** A cross-sectional study was conducted from July 23 to August 26, 2024, using a stratified sampling method followed by simple random sampling on 643 participants using a structured, pre-tested closed questionnaire. Data was collected by Kobo Toolbox software and exported to STATA version 17.0 for analysis. Descriptive analysis and cross-tabulation was performed to present the data. Both bivariate and multivariate logistic regression analyses were computed with a 95% confidence interval. Variables with a p-value of less than 0.05, along with their Adjusted Odds Ratios (AOR), were identified as predictors of the outcome variables in the study. **Results:** In the current study the voluntary enrollment rate in community based health insurance was 68.6%. In the study, as age increased in one year, enrollment increased by 0.033 [95% CI: 0.006, 0.056]; the higher income indicating 0.771 [95% CI: -1.862, 0.848] increased enrollment in community based health insurance keeping other variables constant. However, availability [-0.551, (95% CI: -1.053, 0.078)], and accessibility [-0.565, (95% CI: -1.097, -0.005)] of quality health services are negatively correlated with enrollment in community based health insurance. **Conclusions and Recommendations:** The voluntary enrollment rate in community-based health insurance services was 68.6%. Age and income were positively associated with enrollment, while accessibility and the availability of quality healthcare were negatively associated. Therefore, the relevant organizations and stakeholder should take the following actions as recommendations: launch targeted awareness campaigns, address barriers for waiting time, enhance strategies that improve service availability and accessibility, and offer subsidy methods, and conduct qualitative research such as in-depth individual interviews and delphi technique to further explore the barrier for community based health insurance enrollment to gain further insights.

Keywords

Community-based Health Insurance, Enrolment, Health Service Utilization, Lideta Sub- city

*Corresponding author: asefataresa@gmail.com (Asefa Taresa), tare_ase@yahoo.com (Asefa Taresa)

Received: 17 April 2025; **Accepted:** 3 May 2025; **Published:** 6 June 2025



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1. Background

Access to Universal Health Coverage (UHC) has become a global priority, as healthcare access is essential for human well-being and sustainable development. Community-Based Health Insurance (CBHI) schemes are a vital part of UHC strategies and have great potential to improve healthcare coverage, especially for vulnerable populations [1]. In many low- and middle-income countries, achieving UHC has been challenging due to limited economic resources, slow economic growth, restrictions in the public sector, and the government's weak institutional capacity [2].

However, research indicates the theoretical perspectives and empirical evidence suggest the traditional CBHI model, which relies solely on voluntary, small-scale schemes with minimal or no subsidies for poor and vulnerable groups, has a limited capacity to help countries progress UHC [1]. The CBHI scheme is an effective approach to achieving UHC by offering financial protection against healthcare costs. This system allows community members to pool resources to support each other financially, ensuring equitable access to sustainable, quality healthcare and enhancing social inclusion for families in Ethiopia [3].

The use of CBHI schemes has been on the rise in Sub-Saharan Africa (SSA), particularly in Ethiopia. Recent studies indicate that the percentage of CBHI users in 2022 ranged from 45% to 66% [4-6]. Ethiopia has been piloting CBHI schemes since 2018 to gather insights for potential nationwide implementation. Preliminary findings from schemes in 13 districts show promising results. Between 2015 and 2020, nearly 7 million households, which encompasses about 32 million people, enrolled in the CBHI scheme. Of these, approximately 5.5 million households paid the annual premium [3].

The CBHI program in Ethiopia has greatly increased access to healthcare services for individuals who previously faced financial obstacles. As a result, access to essential health services through CBHI has led to improved health outcomes in Ethiopian communities. Members are now more likely to seek early treatment for illnesses, receive preventive care, and follow prescribed treatment regimens. This has resulted in better overall health and reduced rates of morbidity and mortality [7].

Despite being introduced in Ethiopia, the utilization of CBHI services in Addis Ababa remains suboptimal at only 60%. There are noticeable disparities based on gender, household size, income, and education level. Key challenges contributing to this situation include poor service delivery, lack of awareness, and inadequate healthcare infrastructure [8]. Therefore, it is crucial to address these issues to improve health outcomes and achieve equitable access to healthcare in Addis Ababa. Thus, the objective of this study was to assess the voluntary enrollment and associated factors in community-based health insurance services in Lideta Sub-city, Addis Ababa, Ethiopia.

2. Methods and Materials

2.1. Study Area and Period

This study was conducted in the Lideta sub-city of Addis Ababa from July 23 to August 26, 2024. Lideta is one of the eleven sub-cities within the Addis Ababa city administration. The sub-city has a population of 365,802 and is divided into ten districts, which are served by eight government health centers [9].

2.2. Study Population

The study population consisted of community-based health insurance beneficiaries over 18 years old, who were selected for inclusion in this study during the study period.

2.3. Sample Size Determination

The sample size was calculated using a single population proportion method, as established by Tao Ye Man in 1967 for a finite population. The sample size formulas were based on a specific equation that does not require an alpha level or p-value; however, it does require an error value (e-value), typically set at 0.05 (5%). The formula is detailed in Yeman's work from 1967 [10]. In this study the Yeman formula was presented as follows below:

$$n = N / (1 + Ne^2)$$

Where:

n is the maximum sample size required.

N is the total population size, estimated to be 18735.

e is the acceptable value error and estimated to be 0.05.

Based on this, and using the above Yeman formula, the calculated sample size for the study was 390. Considering the design effect of 1.5 with two stages of strata and 10% none response rate the final sample size (n) to be included in this study was 643.

2.4. Sampling Technique and Procedure

To collect data for this study, a stratified random sampling technique was used to determine the final sample size across the eight districts of Lideta sub-city. The research included all eight district health centers within Lideta sub-city. Respondents were selected using a simple random sampling method, and proportional allocation was applied. The sampling procedure for this study is illustrated in the schematic representation shown in Figure 1.

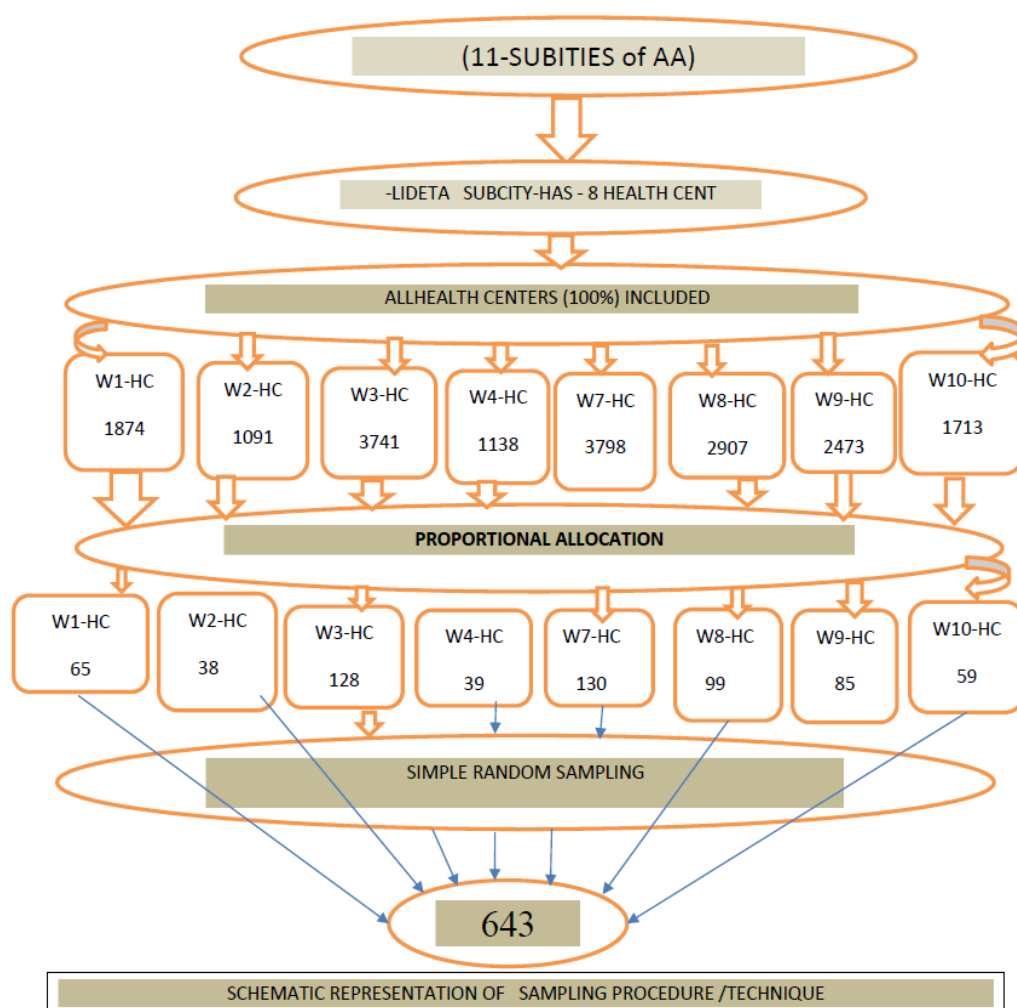


Figure 1. Schematic Presentation of the Sampling Procedure.

2.5. Operational Definitions

1. **Accessibility of Quality Health Services:** In the current study, the accessibility of quality health services was assessed using eight questions designed to measure quality, with responses based on a five-point Likert scale indicating the degree of agreement. The scores from the Likert scale were then summed to determine a median score. Individuals who scored below the median were considered to have inaccessible quality health services and were coded as (0). Those who scored equal to or above the median score were regarded as having accessible quality health services and were coded as (1).
2. **Availability of Quality Health Services:** In the current study, the availability of quality health services was assessed using five questions designed to measure availability, with responses based on a five-point Likert scale indicating the degree of agreement. The scores from the Likert scale were then summed to determine a median score. Individuals who scored below the median were considered to have unavailable quality health services and were coded as (0). Those who scored equal to or above the median score were regarded as having available quality health services and were coded as (1).
3. **Health Care Utilization:** In this study healthcare utilization was measured by tracking the number of visits made by at least one member of a household to healthcare services—either diagnostic or treatment services—at least once in the last six months among members of community-based health insurance.
4. **Healthcare Institutions:** In this study, healthcare institutions were described as health-oriented organizations that were formally established, including health centers, clinics, pharmacies, and hospitals operating in the study area.
5. **Community-based health insurance:** In this study, community-based health insurance is described as a scheme in which community members prepay for healthcare services. This system is based on solidarity and the voluntary collective pooling of resources to share the financial risks associated with healthcare. The community members have ownership of the scheme and control its management.

6. Sufficient Staff: "Sufficient staff" refers to the minimum human resources and professional requirements needed in each department or ward. A chronic illness is defined as a disease condition that lasts longer than three months.

2.6. Instruments

Face-to-face interviews were conducted with CBHI users using structured questionnaires adapted from various sources [5, 11-13]. The developed questionnaire was initially prepared in English, then translated into Amharic, and subsequently back-translated into English to ensure accuracy. The content of the questionnaire included socio-demographic characteristics, health service quality, health service access, and factors related to waiting times. In this study, modifications were made to the economic model. For the econometric model specification, we employed the qualitative logit model. This model was chosen because the dependent variable, the utilization of CBHI services, is a categorical variable with two possible outcomes: yes or no. The qualitative logit model is preferred due to its mathematical simplicity and its ability to analyze and understand the relationships between variables that influence the accessibility and availability of quality health services. The independent variables in this study can be either continuous or categorical and are used to explain the variation in the dependent variable. The independent variables examined include age, gender, occupation, educational level, marital status, and the accessibility and availability of quality health services. Additionally, individual health status has also been considered as a factor affecting the utilization of CBHI services. The logit model in the current study was described as follows: Let's assume that (Y) represents an outcome with two categories: 0 and 1. In this case, $(P(Y))$ refers to the cumulative probability that (Y) is less than or equal to a specific value.

Specification: The dependent variable was dichotomous (yes, no). A binary model was used, and the logit model was preferred due to its mathematical simplicity. The general formula for the logit model is as follows.

The logit model formula,

$$p(y) = 1 / (1 + e^{-z}) \quad (1)$$

Probability of enrolment was written as follow:

$$\text{pr}(\text{enro}=1) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \dots + \beta_k X_k + u_i \quad (2)$$

$$\text{Pr}(\text{Enrolment} = 1) = (\beta_0 + \beta_{\text{Age}} + \beta_{\text{LIncome}} + \beta_{\text{Access}} + \beta_{\text{Availability}}) \quad (3)$$

where:

Enrolment (dep) was the dependent variable representing the level of CBHI service in the center (1=yes, 0=no)

β_0 was the intercept for the dependent variable

β_1 — β_k was the slope against independent variables of

X_1 — X_k

X_1 X_k was the independent variables represented in the model

U_i was the error terms in the model

In general, the assumptions of the logit model include the following:

****Assumption:**** The dependent variable must be binary, meaning it can only take on two values, typically coded as 0 and 1.

****Implication:**** If the dependent variable is not binary, the logit model is not suitable.

2.7. Data Collection, Data Quality, Data Processing and Analysis

Data was collected using a structured interview questionnaire. This questionnaire was initially translated from English to Amharic and then back to English to ensure consistency. To ensure the quality of the data, a well-designed data collection instrument was pre-tested with 5% of the total sample size in the Kirkos sub-city of Addis Ababa, Ethiopia. The research instrument was evaluated for internal consistency using the Cronbach alpha coefficient, which was found to be $\alpha = 0.71$. The instrument was pre-coded, and necessary corrections were made before it was finalized. Three graduate degree holders were trained in data collection, along with two graduate degree supervisors and the researchers. Data was collected using Kobo Toolbox software and then exported to STATA version 17.00 for analysis. Descriptive statistics were presented using frequency and proportion tables, graphs, and summaries of statistics. A Chi-square (χ^2) test was conducted for categorical data to compare the variables of healthcare service users with independent variables. A binary logistic regression model was employed to analyze the impact of the CBHI scheme on the utilization of healthcare services. Initially, a bivariate analysis was conducted to identify the significant independent variables affecting healthcare service utilization. Factors with a significance level of less than 0.25 from the bivariate analysis were then included in a multivariable analysis to assess the effects of CBHI membership and other variables on the likelihood of using healthcare services. The final p-value of less than or equal to (≤ 0.05) was considered to indicate significant factors and the strength of association between the dependent variable and independent variables (covariates), expressed as coefficient units with a 95% confidence interval.

2.8. Ethical Consideration

Ethical approval was obtained from the research and ethics review committee of Skill Marr College, and a written notification was sent to the Lideta Sub-city Health Office. The medical team of the Lideta Sub-city Health Office then issued a letter to each health center to facilitate the study and data collection. Before data collection began, data collectors in-

formed respondents about the purpose of the study, and verbal informed consent was obtained from all participants, either through fingerprinting or by signing the consent form. The study participants had the right to stop the interview at any time during the process.

3. Results

In the current study, a total of 441 participants were included, resulting in a response rate of 68.6 percent. The study found that the voluntary enrollment rate in Community Based Health Insurance services was 68.6%.

3.1. Socio Demographic Characteristics

The average age of the enrolled participants was 46.7 years, with a standard deviation of 8.65 years and a median age of 45 years. The mean monthly income was 5,626 Ethiopian Birr, with a median of 5,600 Ethiopian Birr and a standard deviation of 1,862 Ethiopian Birr. Regarding gender, 56.46% of the participants (249 individuals) were female. Most participants were aged between 40 and 49 years or older (see Table 1).

Table 1. Socio-demographic characteristics of participants (n = 441).

Variables	Character	Frequency	Percent%
Age group	20-29	18	4.1
	30-39	50	11.3
	40-49	210	47.6
	50-59	132	29.9
	60-69	31	7.0
Gender	Male	192	43.54
	Female	249	56.46
Marital status	Single	117	26.5
	Widowed	54	12.2
Family size	Married	267	60.5
	2-5 members	11	2.5
	>5	430	97.5
Educational Status	Not read and write	8	1.8
	College and above	50	11.3
	Primary 1-8 th	34	7.7
	Secondary 9-12 th	349	79.1
Occupational status	Daily laborer	20	4.5
	House wife	43	9.8

Variables	Character	Frequency	Percent%
Monthly income	merchant	155	35.1
	Private employer	219	49.7
	1000-5000	156	35.4
	5001-9000	274	62.1

3.2. Individual Related Characteristics

In the current study, individuals which accounts for 31.1 percent learned and heard community based health insurance from family members. However, 20 percent and 8.8 percent of participants heard CBHI as sources of information from their friends and media respectively (Table 2).

Table 2. Individual Related Characteristics (n= 441).

Variables	Category	Frequency	Percentage%
Source of information	Media	39	8.8
	Family	146	33.1
	Friend	90	20.4
	Low income	83	18.8
	More family size	107	24.3
Reason for joining CBHI service	Because chronic disease	168	38.1
	To reduce out of pocket	83	18.8
Number of visit health facility	<2times	130	29.5
	>2times	167	37.9
Aware of service package	Yes	336	76.2
	No	105	23.3
Have Chronic disease	Yes	372	84.4
	No	69	15.6
Type of chronic disease	Asthma	96	21.8
	Cardiac	26	5.9
	DM	105	23.8
	HPN	145	32.9
Do you agree amount of payment	Yes	276	62.5
	No	165	37.4

Furthermore, among participants in this study, the majority of the participants who visited health facilities among CBHI

members were due to chronic or other diseases such as hypertension (32.9%) and diabetes (23.8%) as presented in the

following Figure 2 below.

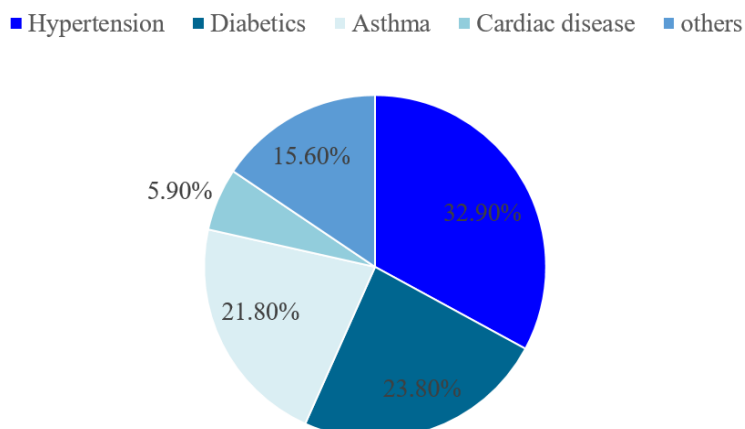


Figure 2. Reasons for respondents to visit health facilities.

3.3. Availability and Accessibility of Quality Health Service and Respondents' Satisfaction with CBHI Services

In this study accessibility of suitable health facilities re-

spondents' level of satisfaction was 20.6% from very satisfied to 29.3% dissatisfied. Moreover, 177 (40.1%) of respondents were satisfied with the availability of suitable health facilities; however 29 (6.6%) of respondents were dissatisfied. (Tables 3 and 4).

Table 3. Accessibility of quality Health service (n= 441).

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied	Total
Accessibility of suitable health facility	91(20.6)	174(39.5)	47(10.7)	129(29.3)	0	441(100%)
Assigned experienced and skilled	26(5.9)	193(43.8)	39(8.8)	183(41.5)	0	441(100)
Accessibility of suitable service	41(9.3)	138(31.3)	53(12)	209(47.4)	0	441(100)
Accessibility of drugs/medical supplies	35(7.9)	209(47.4)	48(10.9)	138(31.3)	11(2.5)	441(100)
Accessibility of laboratory diagnostic tools in	26(5.9)	171(38.8)	50(11.3)	194(44)	0	441(100)
Accessibility of referral system	37(8.5)	152(34.5)	78(17.7)	164(37.2)	10(2.3)	441(100)
Access to Information provision	29(6.6)	153(34.7)	64(14.5)	195(44.2)	0	441(100)
Access to member payment system	31(7.0)	183(41.5)	60(13.6)	167(37.9)	0	441(100)

Table 4. Availability of quality Health services (n=441).

Items	V/satisfied N (%)	Satisfied N (%)	Neutral N (%)	Dissatisfied N (%)	V/dissatisfied N (%)	Total N (%)
Availability of Clean health facility	29(6.6)	177 (40.1)	45(10.2)	190(43.1)	0	441(100%)
Availability skilled professionals	21(4.8)	165(35.1)	56(12.7)	209(47.4)	0	441(100)

Items	V/satisfied N (%)	Satisfied N (%)	Neutral N (%)	Dissatisfied N (%)	V/dissatisfied N (%)	Total N (%)
Availability of suitable service delivery room	34(7.7)	155(35.1)	48(10.9)	204(46.3)	0	441(100)
Availability to prescribed medication/supplies	42(9.5)	154(34.9)	54(12.2)	191(43.3)	0	441(100)
Availability of all laboratory request tests in facilities	36(8.2)	147(33.3)	58(13.2)	198(44.9)	0	439(99)
	37(8.4)	185(42)	58(13.2)	161(36.5)	0	441(100)
		160(36.3)				

3.4. Factors Associated with Community Based Health Insurance

Econometric Analysis

In the current study, the researchers utilized a binary logit model to address the research questions. The results from the econometric logit model revealed that age, household income, accessibility, and the availability of quality health services were significant factors. The researcher expressed the model as follows:

Logit (Enroll-CBHI) = $B_0 + \beta_1 * \text{age} + \beta_2 * \ln(\text{income}) + \beta_3 * \text{accessibility} + \beta_4 * \text{availability of quality health services}$.

The researcher interpreted the coefficients (β_1 , β_2 , β_3 , β_4) as the impact of each independent variable on the dependent variable using marginal effects, due to the nature of non-linear models. Many models in statistics and econometrics are non-linear, meaning the relationship between independent and dependent variables is not a straight line. In these models, the effect of a change in one variable can vary based on the values of other variables. To interpret this, marginal effects help us understand the local impact of a change in a predictor variable on the predicted outcome. This provides a more precise in-

terpretation than simply examining the coefficients in a model.

Based on the information provided, this study found that the accessibility and availability of quality health services, along with the respondents' income and age, were significantly associated with the enrollment and usage of CBHI. In this study, age was the first variable analyzed, with a coefficient of 0.033 [95% CI: 0.006, 0.056]. This suggests that for every one-year increase in age, the probability of being enrolled in the CBHI scheme increases by 0.033 units [95% CI: 0.006, 0.056], while keeping other variables constant. Additionally, the coefficient of 0.771 [95% CI: -1.862, 0.848] for monthly income indicates that higher household income is associated with a 0.771 [95% CI: -1.862, 0.848] increase in the probability of enrollment in a community-based health insurance program. Conversely, the unavailability of health resources at the facility was found to decrease enrollment in community-based health insurance by 0.565 [95% CI: -1.053, 0.078]. This coefficient of -0.565 [95% CI: -1.053, -0.078] indicates that the lack of available resources reduces the likelihood of enrollment in the CBHI scheme. Regarding accessibility of health services, enrollment is negatively associated with CBHI by -0.551 [95% CI: -1.097, -0.005] (Table 5).

Table 5. Results of logit model (Regression analysis) on voluntary enrolment of CBHI and associated factors (n=441).

Vol_enrolled	Coef.	t. Err	T-value	P-value	95% CI	
					Lower value	Upper value
Age of respondents	.033	.013	2.44	.015	.006	.059
Fam _size	-.507	.691	-0.73	.463	-1.862	.848
Income of respondents	.771	.344	2.24	.025	1.098	1.444
Access for quality H/Services	-.551	.279	-1.98	.048	-1.097	-.005
Availability for quality H/services	-.565	.249	-2.28	.023	-1.053	-.078
Awareness for Benefit of CBHI	.292	.254	1.15	.25	-.206	.79

Vol_enrolled	Coef.	t. Err	T-value	P-value	95% CI
Constant	-4.539	3.046	-1.49	.136	-10.51 1.431
Mean dependent var		0.636	SD dependent var		0.482
Pseudo r-squared		0.067	Number of obs		439
Chi-square		38.799	Prob > chi2		0.000
Akaike crit. (AIC)		551.12	SD dependent var		579.711

*** p<.01, ** p<.05, * p<.1

4. Discussions

In this study, the percentage of individuals voluntarily enrolled in CBHI service utilization was 68.6%, which is lower than the national target of 80% reported in a study conducted in Ethiopia in 2020. This difference may be attributed to variations in the study settings. Consequently, these findings can assist national policy designers and implementers in developing effective interventions and policy directions [14].

This finding is higher than the result from a study conducted in the Finfine Special Zone around Shaggar City, which reported a utilization rate of 49.8% [15]. Additionally, another study from the Ethiopia Mini Demography indicated a rate of only 33.13% [16]. In contrast, a similar study carried out in the East College Zone demonstrated a utilization rate of 60.5% [17]. Furthermore, a meta-analysis conducted in Ethiopia found an overall utilization rate of 55.97% [14].

A study conducted in Addis Ababa found that approximately 60% of respondents were enrolled in the CBHI service [5]. Similarly, a study in the Gonder area reported that 64.9% of participants utilized the CBHI service [17]. In addition, a meta-analysis revealed an overall enrollment rate of 62.26% [12]. The variations in these enrollment figures may be attributed to differences in study populations, participant behavior, timing of the studies, and geographical locations. Factors such as social behavior, the socioeconomic conditions of the subjects, and the specific timing of each study may also contribute to these differences.

This study is in line with findings from Kellem Wollega, where 67.6% of members were enrolled in the CBHI scheme [18]. A similar study conducted in Oromia in 2021 reported an enrollment rate of 66.3% [11]. The differences in results between this study and previous research may be attributed to sociocultural and socioeconomic factors. Notably, the enrollment rate in the current study is lower than the 81.5% enrollment rate reported in a 2019 study from the Oromia region [19]. Additionally, a study in the Gondar Zone of Northwest Ethiopia found a CBHI enrollment rate of 67.8% [20]. These findings indicate that the utilization of CBHI

services varies significantly by location.

Additionally, age, income, access to, and availability of quality healthcare were significantly related to enrollment in the CBHI program. The analysis of age revealed a coefficient of 0.033, indicating that for each additional year of age, the likelihood of enrolling in the program increases by 0.033 units, assuming other factors remain constant. This finding suggests that older individuals are more likely to participate in the CBHI program. When comparing age to previous studies, it's important to note that while similar topics have been investigated, none specifically reported marginal effects or coefficients; instead, they typically presented results in terms of odds ratios or log odds.

Regarding income, individuals with higher incomes were more likely to enroll in the CBHI program compared to those with lower incomes. However, comparable findings from earlier studies were not available, primarily due to differences in modeling approaches. The analysis also examined accessibility and availability of quality healthcare. It was found that greater availability and access to healthcare services tend to decrease the likelihood of enrollment in the CBHI program. When access to and availability of quality health services were limited, the number of enrolled members decreased. Like the other variables, there were no comparable studies available due to differing methodologies.

5. Conclusions and Recommendations

In the current study, the overall voluntary enrollment rate in CBHI was 68.6%. The findings revealed that the age of respondents and their household income were positively associated with the voluntary enrollment in CBHI. Conversely, concerns regarding the accessibility and quality of healthcare were negatively related to voluntary enrollment in these programs. Based on these conclusions, the following recommendations were made:

****Launch an Awareness Campaign:**** Develop a targeted campaign to raise awareness about the benefits and objectives of CBHI, particularly aimed at low-income and underprivileged populations.

****Improve Accessibility:**** Address barriers to accessing quality healthcare by reducing wait times, increasing the

availability of health workers in type and medical items, and exploring ways to lower out-of-pocket costs. Additionally, enhance the physical accessibility of healthcare facilities for individuals with disabilities.

****Offer Incentives:**** Consider providing financial incentives, such as subsidies or payment plans, to make CBHI more affordable, especially for lower-income individuals.

****Conduct In-Depth Research:**** Utilize qualitative research methods, including the Delphi technique, to further investigate the barriers to CBHI at both the community and facility levels.

Abbreviations

CBHI	Community Based Health Insurance
SSA	Sub Saharan Africa
UHC	Universal Health Coverage
WHO	World Health Organizations

Acknowledgments

The authors express gratitude to study participants, data collectors, supervisors, and all individuals who contributed to this study.

Authors Contribution

Mohammed Hassen: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Software, Visualization, Writing - original draft.

Abebe Derbie: Conceptualization, Methodology, Software, Supervision, Validation, Writing - review & editing.

Asefa Taresa: Conceptualization, Data curation, Formal Analysis, Methodology, Supervision, Validation, Validation, Writing - review & editing.

Dawit Regasa: Conceptualization, Data curation, Methodology, Supervision, Validation.

Funding

This work is not supported by any external funding.

Conflicts of Interest

The authors declare no conflicts of interest.

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