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Determinants of household community based health insurance membership and healthcare expenditures in rural Awi Zone, Ethiopia: a bivariate logistic regression approach

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Abstract

Introduction In many developing countries, including Ethiopia, out-of-pocket expenditures for healthcare at the point of service delivery often hinder access to necessary health services, particularly in rural areas where poverty prevails. The purpose of this study was to assess the factors associated with healthcare expenditure and Community Based Health Insurance (CBHI) membership in rural areas of the Awi Zone, Northwest Ethiopia.

Methods A community-based cross-sectional study on 2939 heads of household was conducted using a multistage sampling technique. The data were edited and cleaned using STATA 18 and analyzed in SAS 9.4. Bivariate logistic regression analyses were used to identify factors associated with healthcare expenditure and CBHI membership.

Results Out of the 2939 participants, 1740 (59.2%) were members of the CBHI, and 1757 (59.8%) incurred healthcare expenses, Disability was a significant predictor for both CBHI membership (AOR = 1.45; 95% CI: 1.23, 2.86) and healthcare expenditure (AOR = 1.53; 95% CI: 1.07, 2.19). income with 5001–10,000Birr also a significant predictor for both CBHI membership (AOR = 0.43; 95% CI: 0.31, 0.58) and healthcare expenditure (AOR = 1.69; 95% CI: 1.27, 2.24). no chronic illness also other significant predictor for both CBHI membership (AOR = 1.53; 95% CI: 1.23, 1.86) and healthcare expenditure (AOR = 1.3; 95% CI: 1.07, 1.58). In addition, gender, family size for health care expenditures, and place of residence for CBHI membership were significant predictors.

Conclusion These findings highlight the need for targeted interventions to improve the understanding and perception of CBHI among rural households, with a focus on these key determinants. Policies should aim to increase CBHI membership and minimize healthcare expenditure, and awareness campaigns should be enhanced, with a focus on vulnerable groups such as females, people with disabilities, those with chronic illnesses, and low-income households.

Keywords CBHI membership, Healthcare expenditures, Ethiopia, Households, Awi zone, Factor



1 Introduction

The primary goal of healthcare systems is to improve community health outcomes while simultaneously shielding households from the financial ruin caused by illness [1]. The WHO 2000 Report highlighted that effective health systems are vital for individual well-being and economic stability [2]. The WHO report emphasized that universal health coverage (UHC) allows everyone to access health services without experiencing financial hardship [3]. The Sustainable Development Goals (SDG's) and UHC are two health initiatives that aim to improve accessibility to basic health services for all [4]. To set the agenda, public spending on health, its distribution, effectiveness, and associated issues are frequently the main focus of global health policies [5].

Healthcare expenditure is a major concern for households globally, particularly in low-income and rural areas [6, 7]. Out-of-pocket (OOP) payments are still required for the majority of people in low-income countries and some in middle-income countries. This is an unfair and unsustainable method of paying for medical care [8]. Out-of-pocket (OOP) health spending in India is still high at over 51%, which puts a significant financial strain on people, especially in areas with low economic status. Conversely, nations like China (35%) and Sri Lanka (47%) exhibit somewhat lower OOP shares [9]. In India, the CBHI system is more effective in providing health insurance to poor and rural populations, with increased participation due to better trust in the scheme [10]. This is due to the CBHI schemes in India in regard to their designs, sizes and target populations [11].

In order to achieve UHC, African nations have implemented health insurance to increase access, safeguard the weak, gather resources, and improve the quality of care [12]. In sub-Saharan Africa, particularly in Ethiopia, a majority of individuals do not have formal health insurance and depend on out-of-pocket expenses, which restricts their access to standard healthcare services [13, 14]. In developing countries, including Ethiopia, financing healthcare through the CBHI scheme enables households to access affordable, equitable and high-quality services [14, 15]. Many developing countries like Ethiopia have set up community-based health insurance (CBHI) schemes through prepayment risk pooling of resources like government subsidies, member contributions, and donor support to cover the costs of healthcare services [16]. While health insurance improves financial resources and access to care in underdeveloped African countries, it is still limited to a few countries like Tanzania, Senegal, and Mali [17].

In Ethiopia, health insurance coverage stood at 28.1% in 2019, This rate is higher than the average in sub-Saharan Africa, where many countries report coverage below 15%, though it remains lower than countries like Rwanda and Ghana [18]. Ethiopia is projected to achieve 50–70% health insurance coverage by 2030, driven by ongoing efforts to expand community-based health insurance schemes in line with national health policy goals [9]. However, health financing remains a significant challenge. Ethiopia spends 3.2 to 3.5% of its GDP on health care, although only 1.9% of that is funded by the government. Spending may need to increase by 5–7% in order to accomplish the SDGs and UHC by 2030 [19]. and Ethiopia spends about US\$27 per person per year on healthcare one of the lowest rates among developing countries [20] Ethiopia's health spending has stayed between 4 and 5% of overall government spending in recent years, falling short of the Abuja Declaration's goal of 15% of the national budget [21] and the national poverty rate in Ethiopia is approximately 24% [22].

Additionally, cross-subsidization or the sharing of healthcare costs between wealthy and poor people fosters community solidarity, providing financial security and reducing out-of-pocket payments for healthcare [24]. To address these challenges, Ethiopia launched a CBHI pilot in 2011 targeting rural and informal sector households in 13 districts located in four central regions (Tigray, Amhara, Oromia, and South Nations Nationalities and People (SNNP)) of the country [25]. These schemes pool resources through prepaid contributions, government subsidies, and donor support, aiming to provide financial protection and equitable healthcare access [16].

In Ethiopia, in rural regions such as the Awi Zone, households face a significant burden of healthcare costs, which are primarily financed out-of-pocket [27]. Financial stress relates to poverty and poor health outcomes, with rural areas experiencing obstacles such as inadequate infrastructure, large travel distances to treatment, and low socioeconomic status. Rural communities continue to face barriers to accessing healthcare, despite CBHI efforts. Although CBHI programs attempt to promote financial security and fair healthcare access, but their impact on lowering healthcare costs and expanding rural participation is unknown. Socioeconomic position, health behavior, and institutional dynamics all have an impact on CBHI membership and health spending [28]. This study uses bivariate analysis to explore these relationships further. In addition, the role of CBHI in reducing the financial burden on vulnerable populations, such as low-income and rural households, has received little attention. This study aims to identify factors influencing healthcare expenditures and CBHI membership in order to inform more equitable and effective health policies.

2 Methods

2.1 Study design and setting

A cross-sectional study was recently undertaken in the Awi Zone, located in northwest Ethiopia, conducted during the fiscal year 2023 (September 1st to June 30th, 2023). According to The 2015 Ethiopia census projection, it is estimated to be approximately 1,264,203, of which 1,057,604 (83.7%) are rural residents and 206,599 (16.3%) are urban residents. Among the total population, 50.1% are male, and 49.9% are female. Notably, the Awi and Amhara ethnic groups represent the majority, constituting 59.8% and 38.4% of the population, respectively, whereas all other ethnic groups collectively account for 1.8%. Amharic serves as the primary language for 53.4% of the populace, whereas 45.0% speak Awnji, with the remaining 1.6% conversing in various other languages [30, 31].

2.2 Sampling procedure

The study populations were all households who lived in the sample-selected area in the Awi Zone. There are Eleven weredas (District) with administrative towns are in the study area. Hence, with the help of rurality experts, 5 out of 11 District (Jawi, Guangua, Ayehu Guagusa, Dangila Zuria and Zigem) were selected as illustrated in Fig. 1. To assess the study participants, multistage cluster sampling was used, and samples of households were selected from each kebele (Neighborhood) via a random selection method.

The sample size was determined via the population proportion formula, which is based on a 95% confidence level, 50% prevalence of attitude, a 3% margin of error, and a 10% non-response rate [32]. Consequently, the final sample size is 2939, calculated using the formula:

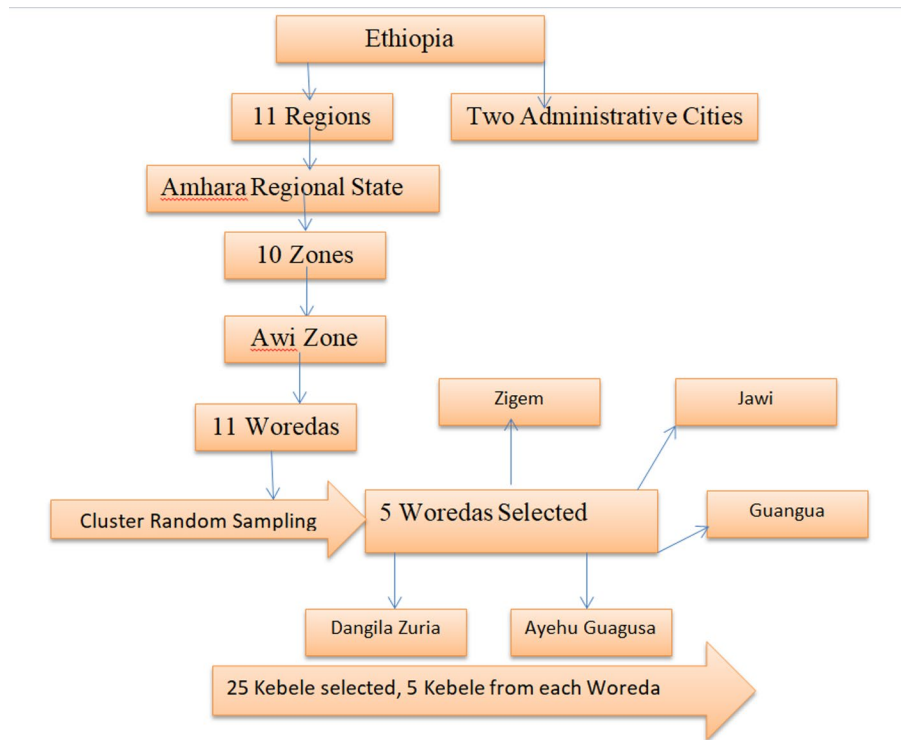


Fig. 1 Schematic diagram indicating study setting and sampling procedure

$$n = \frac{(Z_{\alpha/2})^2 * p * q}{d^2} = \frac{(1.96)^2 * 0.5 * 0.5}{(0.03)^2} = 1067.11 \approx 1,068$$

The study considered a design effect (DEFF) of 2.5, as planned to use a multistage cluster sampling technique [33] and a 10% non-response rate [34]. The final sample size of $n = 2,939$ was computed. Probability proportional to size (PPS) allocations were used to determine the number of households from each woreda (District) and kebele (Neighborhood).

The trained data collectors collected data from the sample households through face-to-face interviews. A structured questionnaire was prepared in English, and for easy communication during the interview, it was translated into a local language such as Amharic or Agewegna and then back to English language to ensure consistency of language during data analysis.

2.3 Variable of the study

This study’s variables were reviewed from related previous research. The variables include response variables and explanatory variables. The response variables of this study are household healthcare expenditures (yes, no) and CBHI membership (yes, no) in the Awi Zone.

The predictor variables for this study included sex, disability status, age, religion, family size, marital status, education level, income, presence of under-five children, presence of elderly individuals, distance from health institutions, transportation availability, presence of chronic illness nearest health institution and residence.

2.4 Operational definition

CBHI: a financing strategy system in which a community or group of people voluntarily contributes money (premiums) to a shared fund [35].

Healthcare expenditure: the total amount of money spent by a household, individual, or society on the acquisition of healthcare services and products.

Households: a social unit comprising individuals who collectively utilize shared resources such as food, housing, and financial assets while inhabiting a specific residential space.

2.5 Data management and analysis

Data cleaning was performed using STATA 18 statistical software. The cleaned data were subsequently exported to SAS version 9.4 software for further analysis. The data were analyzed via PROC LOGISTIC and PROC GLIMMIX, which use the LAPLACE approximation. Descriptive statistics such as frequencies and cross-tabulations were used to describe sociodemographic and economic variables. To examine the relationships between household healthcare expenditure, CBHI membership and the independent categorical variables, a Chi-square test of associations was conducted.

2.6 Bivariate binary logistic regression

Bivariate binary logistic regression is an extension of univariate logistic regression when there are two correlated categorical response variables, such as household CBHI membership and healthcare expenditure. This approach examines the relationship between two correlated categorical dependent variables and their associated independent variables. This study, focused on these two correlated categorical dependent variables, each of which has two categories. Let Y_1 and Y_2 be the two dependent variables, i.e., CBHI membership and healthcare expenditure, respectively. Each can have one of two values (0 or 1), as described in the variable of study. The best method for measuring the relationships among categorical variables is the logistic regression model, which uses the odds ratio [36].

The factors associated with household CBHI membership and healthcare expenditure were checked independently in the bivariable binary logistic regression model, and variables that were statistically significant at a p value of 0.25 in the multivariable binary logistic regression analysis were considered for the final model. Variables with a p value of less than 0.05 were considered statistically significant [37].

2.7 Data quality control

The research use different approaches to maintain the quality of the research. The progress of the study was updated in time for university research and reports. The questionnaire was prepared in English, translated to Amharic and Awigna, and back-translated to English to make it consistent with the questionnaire. The complete questionnaire used in this study is provided in the supplementary file (Supplementary File 1). This file includes all the questions and response options used to collect data from the participants. The scientific merit of different techniques, such as pretesting test data collection tools, updating the data collection tools before actual data collection, frequent supervision and keeping all ethical issues in the planned approach, was maintained. Finally, the collected

Table 1 Frequency and percentage of household health care expenditures and membership in the CBHI

Variable	Categories	Frequency	%
Health care expenditure	Yes	1757	59.8
	No	1182	40.2
Membership of CBHI	Yes	1740	59.2
	No	1199	40.8

Table 2 Characteristics of the continuous variables of the participants (*n* = 2939)

Variables	Min	Max	Mean	Std. deviation
Age	20	92.00	43.87	12.19
Distance to the nearest health services	0.50	50	7.68	7.81

data were carefully checked daily for completeness, outliers and missing values, as well as consistency.

3 Results

The study included 2939 participants with 100% response rate in which an appropriate sample size determination formula was used. The descriptive statistics for the dependent variables and the socio-demographic, economic, healthcare access-related, and health-care needs-related categorical variables are described below.

Table 1 shows summary statistics of the response variable. Among the 2939 respondents, 1757 (59.2%) had health care expenditures and 1740 (59.2%) were members of the CBHI.

The data in Table 2 provide the means and standard deviations for continuous variables among the respondents. The average age of the respondents was 43.9 years, with a standard deviation of 12.2 years, indicating that there is moderate variation in age, and the average distance from a health facility is 7.7 km, with a standard deviation of 7.8 km, indicating a wide range of distances that respondents need to travel to access healthcare services.

The majority of the participants in health care expenditure and CBHI membership were male. Overall, 1453 (49.4%) and 1438 (48.9%) had health care expenditures and CBHI membership, respectively. In terms of disability status, 1663 (56.6%) were normal and had health care expenditures, 1621 (55.2%) were normal and had CBHI membership, and the remaining 194 (3.2%) and 119 (4%) were disabled and had health care expenditures and CBHI membership, respectively, at the time of the study period.

In terms of marital status, 1503 (51.1%) and 1464 (49.8%) were married and had health care expenditures and membership in the CBHI, respectively, at the time of the study period. In terms of residence, 1651 (56.2%) and 1642 (55.9%) respondents were from rural households that had health care expenditures and membership in the CBHI, respectively. The majority of the respondents had medium awareness; out of these, 1159 (39.4%) had health care expenditures, and 1205 (41%) were members of the CBHI.

Furthermore, the findings from Table 3 indicate that several categorical variables are significantly associated with health care expenditures. Specifically, gender (*p* value = 0.04), disability (*p* value = 0.008), income (*p* value = 0.001), religion (*p* value = 0.00), family size (*p* value = 0.001), residence (*p* value = 0.028), presence of elders (*p* value = 0.003), presence of chronic illness (*p* value = 0.001), source of information (*p*

Table 3 Cross tabulation of explanatory with the dependent variable and their associations (n = 2939)

Variable	Category	Health care expenditure		P value	Membership of CBHI		P value
		Yes (>%)	No (>%)		Yes (>%)	No (>%)	
Gender	Male	1453 (49.4)	1008 (34.3)	0.04	1438 (48.9)	1023 (34.8)	0.05
	Female	304 (10.3)	174 (5.9)		302 (10.3)	176 (6.0)	
Disability status	Normal	1663 (56.6)	1090 (37.1)	0.008	1621 (55.2)	1132 (38.5)	0.17
	Disable	94 (3.2)	92 (3.1)		119 (4.0)	67 (2.3)	
Education level of husband	Cannot read and write	979 (33.3)	667 (22.7)	0.19	981 (33.4)	665 (22.6)	0.89
	Can read and write	654 (22.3)	413 (14.1)		629 (21.4)	438 (14.9)	
	Primary and above	124 (4.2)	102 (3.5)		130 (4.4)	96 (3.3)	
Income	< 1000	317 (10.8)	230 (7.8)	0.001	354 (12.0)	193 (6.6)	0.001
	1001–5000	1068 (36.3)	823 (28.0)		1145 (39.0)	746 (25.4)	
	5001–10,000	280 (9.5)	100 (3.4)		207 (7.0)	173 (5.9)	
	> 10,000	92 (3.1)	29 (1.0)		34 (1.2)	87 (3)	
Religion	Orthodox	1658 (56.4)	1071 (36.4)	0.001	1583 (53.9)	1146 (39.0)	0.001
	Muslim	96 (3.3)	100 (3.4)		146 (5.0)	50 (1.7)	
	Other	3 (0.1)	11 (0.4)		11 (0.4)	3 (0.1)	
Family size	Less than 3	489 (16.6)	386 (13.1)	0.006	526 (17.9)	349 (11.9)	0.49
	4 up to 6	822 (28.0)	542 (18.4)		813 (27.7)	551 (18.7)	
	Above 7	446 (15.2)	254 (8.6)		401 (13.6)	299 (10.2)	
Marital status	Married	1503 (51.1)	1004 (34.2)	0.48	1464 (49.8)	1043 (35.5)	0.03
	Single	66 (2.2)	40 (1.4)		74 (2.5)	32 (1.1)	
	Divorced	124 (4.2)	100 (3.4)		145 (4.9)	79 (2.7)	
	Widowed	64 (2.2)	38 (1.3)		57 (1.9)	45 (1.5)	
Residence	Rural	1651 (56.2)	1086 (37.0)	0.028	1642 (55.9)	1095 (37.3)	0.001
	Urban	106 (3.6)	96 (3.3)		98 (3.3)	104 (3.5)	
Source of income	Framing	1601 (54.5)	1045 (35.6)	0.052	1578 (53.7)	1068 (36.3)	0.34
	Merchant	130 (4.4)	112 (3.8)		133 (4.5)	109 (3.7)	
	Other	26 (0.9)	25 (0.9)		29 (1.0)	22 (0.7)	
Presence of under 5 child	Yes	1047 (35.6)	716 (24.4)	0.58	1046 (35.6)	717 (24.4)	0.89
	No	710 (24.2)	466 (15.9)		694 (23.6)	482 (16.4)	
Presence of elders	Yes	383 (13.0)	219 (7.5)	0.031	341 (11.6)	261 (8.9)	0.15
	No	1374 (46.8)	963 (32.8)		1399 (47.6)	938 (31.9)	
Chronic illness	Yes	406 (13.8)	209 (7.1)	0.001	396 (13.5)	219 (7.5)	0.003
	No	1351 (46.0)	973 (33.1)		1344 (45.7)	980 (33.3)	
Source of information	Professional	706 (24.0)	359 (12.2)	0.07	623 (21.2)	442 (15.0)	0.101
	Keble leader	987 (33.6)	771 (26.2)		1058 (36.0)	700 (23.8)	
	Other	56 (1.9)	50 (1.7)		56 (1.9)	50 (1.7)	
	Media	8 (0.3)	2 (0.1)		3 (0.1)	7 (0.2)	
Level of awareness CBHI	Low	498 (16.9)	294 (10.0)	0.001	396 (13.5)	396 (13.5)	0.001
	Medium	1159 (39.4)	773 (26.3)		1205 (41.0)	727 (24.7)	
	High	100 (3.4)	115 (3.9)		139 (4.7)	76 (2.6)	
Transportation road	Yes	1158 (39.4)	764 (26.0)	0.47	1134 (38.6)	788 (26.8)	0.76
	No	599 (20.4)	418 (14.2)		606 (20.6)	411 (14.0)	

>percentage is a proportion of the total sample (n = 2939)

value = 0.001), and level of awareness (p value = 0.001) are statistically significant at the 5% level.

There are variables that are significantly associated with CBHI membership. Specifically, income (p value = 0.001), religion (p value < 0.001), marital status (p value = 0.03), residence (p value = 0.001), presence of chronic illness (p value = 0.003), and level of

awareness (p value < 0.001) are statistically associated with membership in the CBHI at the 5% level of significance.

The joint and marginal probability of membership in the CBHI and health care expenditure and not being a member of the CBHI and health care expenditure was 0.69 (OR = 0.69, 95% CI: 0.56, 0.81), indicating a statistically significant association between membership in the CBHI and health care expenditure. Additionally, the results revealed that 978(33%) had health care expenditures and CBHI membership during the study period. A total of 762 (26%) had no health care expenditures or CBHI members (Table 4).

The joint frequency of factors and different combinations of health care expenditures and membership in the CBHI are shown in Table 5. The descriptive results of this study indicate that the highest proportion of both CBHI membership and health care health were observed in Orthodox, 905 (33.21%). The proportion of respondents who had health care expenditures and no membership in the CBHI who were married was 682 (27.2%). The proportion of respondents who had both health care expenditures and CBHI membership in rural areas was 922 (33.7%). Most of the respondents, 636 (33.1%), had transportation access membership in the CBHI and had health care expenditures.

3.1 Results of bivariate binary logistic regression analysis

Disability, religion, marital status, income, nearest health institution, chronic illness, level of awareness of the CBHI, source of the CBHI, presence of elderly, source of income education of the household head, gender, family size and residence were included in the multivariable analysis on the basis of a p value ≤ 0.25. However, age, availability of roads/ transportation, presence of children under five years of age and distance from health institutions were excluded from the multivariable analysis because their p value was > 0.25.

Therefore, the covariates in Table 6, disability, religion, marital status, income, presence of chronic illness, level of awareness of the CBHI, and source of information about the CBHI, were the determinant factors that affected both CBHI membership and health care expenditure at the 5% level of significance. However, gender and family size were significant predictors of health care expenditures, and place of residence was a significant predictor of CBHI membership.

Table 6 shows that the estimated odds for households with disabilities were 1.45 times (AOR = 1.45, 95% CI: 1.23, 2.86) greater than those of normal households, and the odds of households with disabilities being a member of the CBHI were 1.55 times (AOR = 1.53; 95% CI: 1.07, 2.19) greater than those of normal households (without disability).

The estimated odds of CBHI membership among Muslims were 0.43 times (AOR = 0.43, 95% CI: 0.31, 0.61) likely to be members of the CBHI than those of the Orthodox religion, and the adjusted odds ratio for Muslims with respect to health care

Table 4 Joint and marginal probability of CBHI membership and health care expenditure

	CBHI membership		Marginal of health care expenditure	OR (95% CI)
	Yes	No		
Health care expenditure				
Yes	978 (0.33)	779 (0.26)	1757 (0.60)	0.69
No	762 (0.26)	420 (0.14)	1182 (0.40)	(0.56,0.81)***
Marginal of CBHI membership	1740 (0.59)	1199 (0.41)	2939 (1.00)	

***p value < 0.001

Table 5 Joint frequency distributions of the predictor variables with CBHI membership and health care expenditure in Ethiopia

Variable	Category	CBHI membership and had HCE	No CBHI membership and had HCE	Had CBHI membership and no HCE	No CBHI membership and HCE
Gender	Male	791(32.1)	662(26.9)	647(26.3)	361(14.7)
	Female	187(39.1)	117(24.5)	115(24.1)	59(12.3)
Disability status	Normal	933(33.9)	688(25.0)	730(26.5)	402(14.6)
	Disable	45(24.2)	74(39.8)	49(26.3)	18(9.7)
Education level of husband	Cannot read and write	566(34.4)	413(25.1)	415(25.2)	252(15.3)
	Can read and write	351(32.9)	303(28.4)	278(26.1)	135(12.7)
	Primary and above	61(27.0)	63(27.9)	69(30.5)	33(14.6)
Religion	Orthodox	905(33.2)	753(27.6)	678(24.8)	393(14.4)
	Muslim	71(36.2)	25(12.8)	75(38.3)	25(12.8)
	Other	2(14.3)	1(7.1)	9(64.3)	2(14.3)
Family size	Less than 3	262(29.9)	227(25.9)	264(30.2)	122(13.9)
	4 up to 6	481(35.3)	341(25.0)	332(24.3)	210(15.4)
	Above 7	235(33.6)	211(30.1)	166(23.7)	88(12.6)
Marital status	Married	821(32.7)	682(27.2)	643(25.6)	361(14.4)
	Single	49(46.2)	17(16.0)	25(23.6)	15(14.2)
	Divorced	75(33.5)	49(21.9)	70(31.3)	30(13.4)
	Widowed	33(32.4)	31(30.4)	24(23.5)	14(13.7)
Residence	Rural	922(33.7)	729(26.6)	720(26.3)	366(13.4)
	Urban	56(27.7)	50(24.8)	42(20.8)	54(26.7)
Source of income	Framing	898(33.9)	703(26.6)	680(25.7)	365(13.8)
	Merchant	64(26.4)	66(27.3)	69(28.5)	43(17.8)
	Other	16(31.4)	10(19.6)	13(25.5)	12(23.5)
Presence of under 5child	Yes	574(32.6)	473(26.8)	472(26.8)	244(13.8)
	No	404(34.4)	306(26.0)	290(24.7)	176(15.0)
Presence of elders	Yes	206(34.2)	177(29.4)	135(22.4)	84(14.0)
	No	772(33.0)	602(25.8)	627(26.8)	336(14.4)
Chronic illness	Yes	248(40.3)	158(25.7)	148(24.1)	61(9.9)
	No	730(31.4)	621(26.7)	614(26.4)	359(15.4)
Source of information	Professional	382(35.9)	324(30.4)	241(22.6)	118(11.1)
	Keble leader	562(32.0)	425(24.2)	496 (28.2)	275(15.6)
	Other	32(30.2)	24(22.6)	24(22.6)	26(24.5)
	Media	2(20.0)	6(60.0)	1(10.0)	1(10.0)
Level of awareness CBHI	Low	230(29.0)	268(33.8)	166(21.0)	128(16.2)
	Medium	684(35.4)	475(24.6)	521(27.0)	252(13.0)
	High	64(29.8)	36(16.7)	75(34.9)	40(18.6)
Transportation road	Available	636(33.1)	522(27.2)	498(25.9)	266(13.8)
	Not available	342(33.6)	257(25.3)	264 (26.0)	154(15.1)

expenditures indicated that Muslims were 1.50 times (AOR=1.50, 95% CI: 1.11, 2.03) likely to incur higher health care expenditures than Orthodox households.

Households with incomes between 5001 and 10,000 Birr and greater than 10,001 were significantly associated with both health care expenditures and membership in the CBHI, which means that the odds of households with incomes between 5001and10,000 were 1.69 times (AOR = 1.69, 95% CI: 1.27, 2.25) more likely to have higher health care expenditures but 0.43 times likely to be members of the CBHI (AOR = 0.43, 95% CI: 0.31, 0.58) relative to households with incomes less than 1,000, and households with incomes greater than 10,001 had odds 5.38 times more likely to have higher health care expenditures (AOR = 5.38, 95% CI: 3.43, 8.45) but were 0.38 times (AOR = 0.38 95% CI: 0.23,

Table 6 Estimated coefficient of the risk factor and its 95% CI for the outcome variables of health care expenditure and membership in the CBHI via a bivariate multilevel binary logistic model

Variable	Categories	Membership of CBHI		Health care expenditure	
		AOR(95%CI)	P value	AOR(95%CI)	P value
Intercept		0.46 (0.23, 0.72)***	0.001	1.21 (0.65, 2.23)	0.547
Disability	Normal (Ref.)	1.00	–	1.00	–
	Disable	1.45 (1.23, 2.86)*	0.018	1.53 (1.07, 2.19)*	0.019
Religion	Orthodox (Ref.)	1.00	–	1.00	–
	Muslim	0.44 (0.31, 0.62)***	< 0.001	1.50 (1.11, 2.03)**	0.008
	Other	0.49 (0.09, 2.61)	0.405	8.74 (1.02, 74.96)*	0.048
Marital status	Single (Ref.)	1.00	–	1.00	–
	Married	0.84 (0.57, 1.23)	0.367	1.49 (1.03, 2.17)*	0.036
	Divorced	0.57 (0.37, 0.90)*	0.015	0.94 (0.61, 1.46)	0.795
	Widowed	1.32 (0.81, 2.12)	0.261	1.08 (0.66, 1.77)	0.764
Income	< 1000 (Ref.)	1.00	–	1.00	–
	1001–5000	1.19 (0.96, 1.47)	0.111	1.09 (0.88, 1.34)	0.438
	5001–10,000	0.43 (0.32, 0.59)***	< 0.001	1.69 (1.27, 2.25)***	< 0.001
	> 10,001	0.38 (0.24, 0.62)***	< 0.001	5.38 (3.43, 8.45)***	< 0.001
Nearest health institution	Clinic (Ref.)	1.00	–	1.00	–
	Hospital	1.22 (0.92, 1.61)	0.175	0.80 (0.61, 1.06)	0.1179
	Other	0.02 (0.01, 0.07)	0.644	6.83 (0.99, 9.60)	0.769
	Traditional	1.54 (1.08, 2.20)	0.183	0.89 (0.62, 1.27)	0.515
Chronic illness	Yes (Ref.)	1.00	–	1.00	–
	No	1.53 (1.26, 1.86)***	< 0.001	1.30 (1.07, 1.58)***	0.001
Level of awareness	Low (Ref.)	1.00	–	1.00	–
	Medium	0.46 (0.33, 0.65)***	< 0.001	2.04 (1.46, 2.85)***	< 0.001
CBHI	High	0.55 (0.46, 0.67)***	< 0.001	1.05 (0.88, 1.26)	0.583
	Source of CBHI	Professionals (Ref.)	1.00	–	1.00
Presence of elders	Kebele leaders	1.50 (0.97, 2.32)	0.066	1.5 (0.97, 2.32)	0.072
	Mass media	5.51 (1.30, 23.27)*	0.020	0.21 (0.04, 1.10)	0.065
	Other	1.06 (0.89, 1.25)	0.523	1.68 (1.42, 1.99)***	< 0.001
	Yes (Ref.)	1.00	–	1.00	–
Source of income	No	0.91 (0.75, 1.10)	0.328	1.17 (0.96, 1.42)	0.123
	Farming (Ref.)	1.00	–	1.00	–
	Merchant	1.03 (0.76, 1.40)	0.844	1.32 (0.98, 1.79)	0.070
Education	Other	0.83 (0.44, 1.58)	0.570	1.19 (0.63, 2.22)	0.595
	Cannot read and write (Ref.)	1.00	–	1.00	–
	Can read and write	0.94 (0.794, 1.118)	0.494	0.85 (0.71, 1.01)	0.060
Gender	Primary	1.17 (0.84, 1.64)	0.357	0.94 (0.67, 1.32)	0.724
	Male (Ref.)	1.00	–	1.00	–
	Female	0.82 (0.62, 1.10)	0.183	0.62 (0.47, 0.83)***	0.001
Family size	< 3 (Ref.)	1.00	–	1.00	–
	4–6	0.99 (0.82, 1.20)	0.931	0.91 (0.75, 1.09)	0.308
	> 7	0.79(0.63, 0.99)	0.527	1.07 (0.86, 1.34)	0.039
Residence	Urban (Ref.)	1.00	–	1.00	–
	Rural	1.79 (1.29, 2.48)***	0.001	1.25 (0.90, 1.74)	0.179

* p-value < 0.05, ** p-value < 0.01, ***p-value < 0.001, Ref: Reference group

0.62) likely to be members of the CBHI relative to households with income less than 1000.

Finally, the odds of female households were 0.62 times likely to incur health care expenditures than male households, with an AOR of 0.62 (95% CI: 0.46, 0.83), and

households with more than 7 household members had 1.07 times odds of incurring health care expenditures than families with fewer than 3 household members were (AOR = 1.07; 95% CI: 0.86, 1.34).

4 Discussion

The objective of this study was to find determinants of household Community Based Health Insurance (CBHI) membership and healthcare expenditures in rural Awi Zone, Ethiopia. The findings indicated that 1740 households (59.2%) were members of the CBHI, and 1757 households (59.8%) incurred healthcare expenses. This finding revealed that disability, income of households and chronic illness were significant predictors for both CBHI membership and health care expenditure. Persons with disability were more likely to be a member of the CBHI. This finding is consistent with previous studies that demonstrated that having members with disabilities in the household increases CBHI membership [38–40] because household members with disabilities frequently have higher healthcare needs and financial burdens, increasing their dependence on health insurance systems for coverage and financial protection. The odds of having healthcare expenditure were higher for households having members with disabilities than those without. This finding is consistent with several other studies [41–44]. This is because households having members with disabilities frequently require continuous, specialized care and more frequent medical attention, resulting in higher overall healthcare costs than average households.

This study also revealed that religion of households is an important determinant of CBHI and healthcare expenditure. Muslims are less likely to be members of CBHI than Orthodox households. This finding is in line with previous studies [45, 46] and contradicts one study [47]. According to another study, Muslims were more likely to incur higher healthcare expenditures than Orthodox households [48]. A possible explanation for this finding is that Muslims may prefer alternative healthcare solutions that are more in line with their religious or cultural views, or they may experience geographic, economic, or social challenges in accessing CBHI programs.

In addition, the study found that marital status was another significant determinant of CBHI membership. Divorced households were less likely to be members of the CBHI than single respondents. This finding suggests that marital status plays a crucial role in shaping the membership of CBHI. Divorced individuals often face distinct emotional and financial challenges that can significantly impact their perceptions and attitudes toward healthcare services. This result is also supported by other studies [49, 50]. Married households were more likely to incur higher health care expenditures than single households [51]. This result suggests that, compared with single household heads, married household heads are more likely to spend more on healthcare. A possible explanation for this finding is that married households tend to be more financially stable than single households.

Furthermore, household income is another crucial factor influencing both CBHI membership and healthcare expenditure. Households with incomes between 5001 and 10,000 Birr and greater than 10,001 Birr were more likely to have higher healthcare expenditures than households with incomes less than 1000 Birr. This finding aligns with those of previous studies [52, 53]. On the other hand, households with incomes between 5001 and 10,000 and incomes greater than 10,001 are less likely to be members

of the CBHI relative to households with incomes less than 1000 [54–56]. This is because households with higher incomes are more likely to spend more on healthcare because they can afford more frequent or specialized care. However, they are less inclined to join CBHI since they can pay for healthcare services out-of-pocket.

On the other hand, chronic illness was found to be a significant determinant of both CBHI membership and health care expenditure. Households without chronic illness were less likely to be members of the CBHI, which is consistent with prior research that has shown that households without chronic illness reduce CBHI participation [49, 52]. This is because households without chronic illness may have less need for CBHI because they expect low healthcare costs and choose to pay out of pocket for occasional medical needs. Compared with chronically ill households, those without chronic illness were less likely to incur healthcare expenditures. This finding is consistent with other studies [57–59]. This is because households without chronic illness require fewer and less frequent medical services, whereas households with chronic illness often require specialized care and frequent medical visits.

This study also revealed that Level of awareness CBHI of households is an important determinant of CBHI and healthcare expenditure. Households with medium and high awareness were significantly less likely to be members of the CBHI compared to those with low awareness. this study is contradict with the study [60]. This is due to more informed households may have greater exposure to the limitations or challenges of the CBHI scheme, leading to reduced participation. Alternatively, they may perceive better value in other forms of health financing or private health services.

In addition, family size and sex of the head of household were significant predictors of health care expenditure only. Households with more than seven household members were more likely to incur healthcare expenditures than families with fewer than three household members [61, 62]. Compared with male headed households, female headed households were less likely to incur health care expenditures. This research implies that gender is a significant factor in lower healthcare spending because of underutilization of healthcare services, which may be brought on by a lack of funding, cultural barriers, or reduced power to make decisions [63, 64].

Finally, place of residence was found to be an important predictor of CBHI membership only. Households from rural areas were more likely to be members of the CBHI than urban households were. This finding is consistent with those of a previous study [65]. This is due to lower income levels and restricted access to formal healthcare services, the CBHI is a more cost-effective choice for rural households than for urban households.

5 Conclusions

Despite expanded access to the CBHI package, many households remain non-members, resulting in higher healthcare costs. This study assessed the determinants of household CBHI membership and healthcare expenditures. Gender and family size for health care expenditures and place of residence for CBHI membership were significant predictors. As a result, the researcher recommend that, to increase CBHI membership and minimize healthcare expenditure, awareness campaigns should be enhanced, with a focus on vulnerable groups such as females, those with disabilities, those with chronic illnesses, and low-income households.

5.1 Strength and limitation of the study

The strength of this study used primary data and assures the quality of the data with the standardized data collection tool was used and pretest was done before the actual data collection. As limitation, the study was a cross-sectional study, which may not set a temporal relationship between cause and effect. To address this limitation, future research should consider longitudinal follow-ups, which involve collecting data from the same subjects multiple times. There might be a possibility of recall, limit social desirability, and interviewer bias due to the retrospective tracking of information that will result in underreporting and misreporting of events. However, attention was given to the study procedures, including the process of training data collectors and close supervision throughout the activity to minimize the expected biases. The study emphasizes the importance of increasing knowledge, improving service satisfaction, and lowering financial obstacles in order to boost CBHI services.

5.2 Policy implications

In Ethiopia, the government has implemented the CBHI scheme since 2011 to promote health and wellbeing of poor residents in rural areas. Despite the expansion of CBHI in Ethiopia, this study found that factors such as disability, chronic illness, income, religion, marital status, gender, family size, awareness, and place of residence significantly influence both CBHI membership and healthcare expenditures. To improve enrollment and reduce out-of-pocket costs, targeted interventions should focus on raising awareness, addressing income-related barriers, and ensuring inclusive, culturally sensitive strategies like female and Disable person. These findings can guide local policymakers and program planners in strengthening the CBHI scheme.

Abbreviations

CBHI	Community-based health insurance
CI	Confidence interval
DEEF	Design effect
FMOH	Federal Ministry of Health
OR	Odds ratio
OOP	Out-of-pocket
SNNPR	Southern Nation, Nationalities and People Region
UHC	Universal health coverage
WHO	World Health Organization

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

ZMW, KTG, NAB and WES designed the manuscript. ZMW, HDM, DBB, AM, KKH and NAB participated in data management and critically reviewed and revised the manuscript, contributing to the research. The research team, including ZMW, WES, KTG, DBB, AM, KKH and NAB, conducted the study and participated in the data analysis. All the authors approved the final manuscript.

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Data availability

The corresponding author can provide the datasets used in these studies upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Injibara University Institutional Research Ethics Review Committee (IU/IRERC/100/2025). Written informed consent was obtained from each participant. To maintain the confidentiality of the participants, the researcher avoided collecting identifiable information such as full names, addresses, and identification card numbers. During data collection, the researcher and data collector respected the community's cultural, religious, and ethical considerations. Access to the recorded data was restricted to the research team, and data sharing was conducted under legal and ethical guidelines.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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