

Assessing Health Insurance Coverage and the determinants of non-enrollment among adults in rural Tanzania. A cross-sectional study in Mlimba District

Egron S Ntibabara

egronsaul22@gmail.com

St Francis University College of Health and Allied Sciences

Gervas F Mbuligwe

St Francis University College of Health and Allied Sciences

Lucas J Mitungo

St Francis University College of Health and Allied Sciences

Miraji A Mlala

St Francis University College of Health and Allied Sciences

Agnes H Mpogo

St Francis University College of Health and Allied Sciences

Andrew S Mushi

St Francis University College of Health and Allied Sciences

Jackline L Mwakilima

St Francis University College of Health and Allied Sciences

Grace Y Mduma

St Francis University College of Health and Allied Sciences

Prince A Moshi

St Francis University College of Health and Allied Sciences

Egius H Mwombeki

St Francis University College of Health and Allied Sciences

Jovin R Tibenderana

St Francis University College of Health and Allied Sciences

Erick Luta

St Francis University College of Health and Allied Sciences

Archie Hellar

St Francis University College of Health and Allied Sciences

Philbert Balichene Madoshi

St Francis University College of Health and Allied Sciences

Research Article

Keywords: Tanzania Health Insurance schemes, Health Insurance coverage, and Health insurance coverage determinants

Posted Date: September 2nd, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10515811/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.
[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Health insurance is a key financial risk protection mechanism aimed at reducing out-of-pocket health expenditure and improving equitable access to healthcare. Despite health financing reforms in Tanzania, many households continue to rely on direct payments, exposing them to catastrophic health expenditure, particularly among individuals with chronic illness. Evidence on health insurance coverage and its determinants in rural and semi-urban settings remains limited after the introduction of Universal Health Insurance. This study aimed to assess health insurance coverage and identify determinants of non-enrollment among adults in Mlimba District, thereby providing baseline evidence to inform implementation of Universal Health Insurance.

Methods

A community-based analytical cross-sectional study was conducted in December 2025 among 201 adults selected through multistage sampling. Data on socio-demographic characteristics, health status, and insurance-related factors were collected using structured questionnaires administered through Kobo Collect. Modified Poisson regression was applied to estimate prevalence ratios for factors associated with insurance non-enrollment using STATA version 17.0.

Results

Participants had a median age of 31 years (IQR: 25–41); 55.7% were female, 52.7% had primary education, and 76.1% were self-employed. Overall, 94.5% (95% CI: 90.4–97.0) were not enrolled in any health insurance scheme. Only government employment (aPR = 0.53; 95% CI: 0.29–0.96) and presence of chronic illness (aPR = 0.28; 95% CI: 0.09–0.90) were independently associated with lower prevalence of non-enrollment.

Conclusion

Health insurance non-enrollment in Mlimba District Council remains critically high, underscoring persistent challenges in implementing and enforcing mandatory health insurance enrollment under the UHI framework, particularly among informal sector populations.

1. INTRODUCTION

Health insurance has become a central strategy for improving health financing and expanding access to essential healthcare services, particularly in low- and middle-income countries (LMICs). As countries strive toward Universal Health Coverage (UHC), health insurance provides a structured mechanism for

pooling financial risk and reducing reliance on out-of-pocket (OOP) payments, which remain a major barrier to care in many settings.(2) In systems where insurance coverage is low, healthcare becomes largely dependent on a household's ability to pay at the point of service, resulting in delayed treatment and widening inequalities in access.(3)

Health insurance refers to a prepaid, risk-pooling arrangement where individuals contribute premiums to access healthcare when needed. Health insurance coverage denotes the proportion of people enrolled in any formal insurance scheme, while out-of-pocket expenditure represents direct payments made by patients at the time of seeking care(1). Catastrophic health expenditure occurs when medical costs consume a large share of household income, pushing families into financial distress(1). Determinants are the demographic, socioeconomic, health-related, and system-level factors that influence a person's likelihood of enrolling in health insurance(4). Meanwhile, chronic illnesses such as hypertension, diabetes, asthma, and HIV/AIDS often shape non-enrollment behavior due to the long-term healthcare needs they impose.

Globally, the burden of low health insurance coverage remains substantial. High-income countries report coverage rates above 90% due to strong national schemes, whereas many low-income nations struggle to exceed 20%.(5). In Sub-Saharan Africa, the majority of countries still depend heavily on OOP payments, exposing millions of households to financial hardship. Only a few countries, such as Rwanda and Ghana, have achieved high coverage levels between 80% and 90% by implementing mandatory, government-led insurance systems(6). In contrast, most African nations continue to face high non-enrollment because of affordability barriers, weak scheme awareness, fragmented insurance structures, and limited trust in healthcare services(7).

The consequences of inadequate health insurance coverage are far-reaching as the households without insurance frequently delay seeking care, use traditional remedies, or forego treatment altogether. This pattern contributes to increased morbidity and mortality, especially among individuals living with chronic conditions who require regular medical attention. High OOP payments place families at constant risk of catastrophic spending, pushing many into poverty(2). At the health-system level, high non-enrollment results in smaller risk pools and inadequate financing for improving facility infrastructure, medicine availability, and service quality. This, in turn, creates a cycle where poor service quality further discourages enrollment(8).

Tanzania has made notable efforts to strengthen health insurance coverage through schemes such as the National Health Insurance Fund (NHIF) for formal-sector workers and the Improved Community Health Fund (iCHF) aimed at rural and informal-sector populations (9, 10). However, national coverage remains low recent estimates suggest around 85% of non-enrolled population in any scheme, an increase from earlier levels reported close to 70%. Out-of-pocket payments still account for a significant share of total health expenditure, demonstrating persistent gaps in risk pooling. Research in Tanzania consistently identifies education, income, occupation, marital status, and geographical location as strong determinants of insurance uptake(11). Rural communities, informal workers, and low-income

households remain the least covered due to affordability constraints, long distances to enrollment centers, limited health literacy, and perceptions of poor service quality(12).

In Tanzania, these systemic challenges have persisted despite the existence of schemes such as the NHIF and iCHF. Low enrollment, high out-of-pocket expenditure, and fragmented risk pools have limited progress toward UHC. Recognizing these gaps, the government enacted the Universal Health Insurance Act, which represents a significant policy shift by mandating health insurance for all residents and aiming to unify previously fragmented schemes under a single regulatory framework. This reform is intended to expand coverage, improve financial protection, and strengthen the overall health system. (12). Despite this policy advancement, the transition from legislation to effective implementation remains uncertain, particularly in rural and underserved areas. Structural barriers such as affordability, limited awareness, and perceived poor quality of healthcare services continue to influence enrollment behavior. These challenges are likely to persist even under a mandatory system if not adequately addressed.(13)

Mlimba District exemplifies many of these contextual barriers. As a predominantly rural area with agriculture-based livelihoods and seasonal income, Mlimba faces structural and socioeconomic constraints that limit insurance uptake. Evidence suggests that awareness of insurance benefits is low, premiums are often perceived as burdensome, and long distances to health facilities and registration points discourage non-enrollment(14). Despite a growing burden of chronic illnesses in the district, many affected individuals remain uninsured, increasing their vulnerability to financial hardship(2). Yet, district-level data on the extent of coverage, patterns of non-enrollment, and the influence of chronic disease are limited or outdated, making it difficult for local authorities to design targeted interventions.

This gap in localized evidence highlights the need for a focused district-level assessment. Therefore, the aim of this study is to assess health insurance coverage and its determinants among adult residents of Mlimba District. The study specifically seeks to determine the level of insurance non-enrollment, identify key socioeconomic and demographic factors influencing uptake, and examine how chronic illness shapes decisions to enroll in health insurance.

2 METHODS

2.1 Study Area, design, data source, and sampling procedures

The study was conducted in Mlimba District, situated in Western Ifakara within the Morogoro Region of Tanzania. Based on the 2022 Population and Housing Census, the district has a total population of 292,536 residents, including 146,947 males and 145,589 females. Administratively, Mlimba District is divided into 2 divisions, 16 wards, 62 villages, and 243 hamlets, covering a geographical area of 11,025 km². Of this land, about 578,665 hectares are allocated for settlement, while 407,747 hectares support agricultural activities, including 12,230 hectares under irrigation.

This study adopted analytical cross-sectional design conducted in December 2025. This design was appropriate for estimating the prevalence of health insurance coverage at a single point in time and identifying determinants associated with enrolment in insurance schemes. The study design was cost-effective and time-efficient, making it appropriate for a community-based study in which follow-up of participants was not required. Primary data were collected using interviewer-administered structured questionnaires. The questionnaire gathered information on participants' socio-demographic characteristics, health insurance enrollment status, knowledge and awareness of health insurance, and factors influencing enrollment and non-enrollment, including accessibility and affordability of health insurance services. Data was collected electronically using the KoboCollect tool, which allowed real-time data entry and helped minimize transcription errors. The questionnaire was translated into Kiswahili and back-translated into English to ensure that the questions retained their intended meaning and were easily understood by participants.

A multistage sampling approach was used to select the study areas. First, four wards were randomly selected from the 16 wards in Mlimba District Council using simple random sampling. In the second stage, two villages or streets were randomly selected from each of the selected wards. Within these selected areas, eligible adults were recruited from households as well as from community settings. For participants recruited from households, the head of the household was selected because they were considered the most knowledgeable person regarding the household's health insurance status and other relevant household characteristics. Where the head of household was unavailable, another adult household member who had adequate knowledge of the household's insurance status and characteristics was eligible to participate. Adults encountered in community settings were eligible to participate if they met the study inclusion criteria. These participants provided information primarily about their own health insurance enrollment status, knowledge, experiences, and factors influencing their decision to enroll or not enroll in a health insurance scheme. This approach allowed the study to obtain relevant individual-level information while also capturing household-level information from respondents who were knowledgeable about their households.

The sample size was determined using Cochran's formula for estimating a single population proportion. The calculation was based on an estimated prevalence of 85%, a 95% confidence level, and a 5% margin of error, resulting in a minimum required sample size of 196 participants. During data collection, 201 eligible adults were successfully recruited and included in the study, representing approximately 2.6% more participants than the minimum required sample size. The final sample was therefore slightly larger than the calculated minimum, strengthening the adequacy of the study sample. No separate non-response rate was incorporated into the initial sample-size calculation.

2.2 Study variables

2.2.1 Outcome variable

The outcome variable for this study was the non-enrollment (coded 1 = Yes) if the participant is not enrolled in any health insurance scheme, and (Coded 0 = No) if the participant is enrolled in any health

insurance scheme.

2.2.2 Explanatory variables

The independent or explanatory variables of this study was age categories in young adults (below 35), adults (35–54) and elders (55 and above), Sex (Male and Female), Marital status (Married and Unmarried), Education level (No formal education, Primary, Secondary and above), Occupation (Unemployed, Self-employed and Government employed). Furthermore, Awareness of insurance presence, Status of chronic illness, influence of family size as the driving factor to join health insurance, premiums affordability and quality of health services provided in that area was also the independent variables were measured and examined for their association with insurance non-enrollment.

2.3 Statistical Analysis

Data was exported from Kobo Collect to Microsoft Excel for cleaning and subsequently analyzed using STATA version 17.0. Prior to analysis, data were checked for completeness, consistency, and outliers, and appropriate coding of variables was performed.

Descriptive statistics were used to summarize participants' characteristics and key study variables. Continuous variables such as age were assessed for distribution and summarized using the median and interquartile range (IQR), given their non-normal distribution. Categorical variables including sex, education level, occupation, marital status, and health insurance status were summarized using frequencies and percentages. The primary outcome variable was health insurance non-enrollment status, dichotomized as enrolled or not enrolled. The prevalence of non-enrollment was estimated and presented with 95% confidence intervals (CI).

For inferential analysis, associations between independent variables and health insurance non-enrollment were initially assessed using bivariate analysis. Crude measures of association were expressed as prevalence ratios (PR) with corresponding 95% confidence intervals and p-values.

Given the high prevalence of the outcome ($> 10\%$), modified Poisson regression with robust variance estimation was employed in the multivariable analysis to obtain adjusted prevalence ratios (aPR), as this approach provides more accurate and interpretable estimates than logistic regression, which would otherwise overestimate the odds ratio (OR) under such conditions. Variables with theoretical relevance and those demonstrating association at bivariate level were included in the multivariable model.

The strength and direction of associations were interpreted using adjusted prevalence ratios, along with their 95% confidence intervals. Statistical significance was determined at a p-value of less than 0.05, although odds ratios (OR) are commonly used in cross-sectional studies, they were not the primary measure in this analysis due to the high outcome prevalence; however, the analytical approach ensured valid estimation of relative risk through prevalence ratios.

Therefore, all findings were presented in tables and narrative form, with appropriate reporting of statistical measures including proportions (%), median (IQR), p-values, adjusted prevalence ratios (aPR),

and 95% confidence intervals (CI).

3 RESULTS

3.1 Participants characteristics

A total of 201 adults from Mlimba District Council were enrolled in the study. The median age of participants was 31 years (interquartile range [IQR]: 25–41), with the majority, 124 participants (61.7%), aged below 35 years. Females constituted more than half of the study population, accounting for 108 participants (55.7%). In terms of educational attainment, 106 participants (52.7%) reported having primary education as their highest level of schooling. Regarding occupational status, the majority of participants were self-employed, comprising 153 individuals (76.1%) of the study population. (Table 1)

Table 1
Participants characteristics of insurance non-enrollment at
Mlimba DC, 2025 (N = 201)

Characteristics	Frequency	Proportions
Age (Years) Median (IQR)	31 (25–41)	
Below 35	124	61.7
35–54	67	33.3
55 and above	10	5.0
Sex		
Male	93	46.3
Female	108	55.7
Marital Status		
Unmarried	131	65.2
Married	70	34.8
Education		
No formal education	19	9.5
Primary	106	52.7
Secondary and above	76	37.8
Occupation		
Unemployed	37	18.4
Self employed	153	76.1
Government	11	5.5

3.2 Prevalence of participants non-enrollment.

Of the 201 study participants, the majority were not enrolled in any health insurance scheme, accounting for 190 individuals (94.5%; 95% CI: 90.4–97.0) (Fig. 1). Non-enrollment was most pronounced among participants aged below 35 years, where 119 individuals (96.0%) were uninsured. By sex, non-enrollment was slightly higher among females, with 102 participants (94.4%) not enrolled, compared with males. A similarly high proportion of non-enrollment was observed among unmarried participants, of whom 124 (94.7%) were uninsured. With respect to educational attainment, participants with primary education exhibited the highest prevalence of non-enrollment, with 102 individuals (96.2%) not enrolled in any insurance scheme compared to other education levels. Regarding occupational status, self-employed participants demonstrated the highest prevalence of non-enrollment (149 participants; 97.4%), closely

followed by unemployed participants, among whom 36 individuals (97.3%) were uninsured. (Refer Table 2)

Table 2

Proportion of Participants' non-enrollment in the insurance scheme in Mlimba DC,2025 (N = 201)

Characteristics	Proportions of participants enrolled in the Insurance schemes	Proportions of participants NOT enrolled in the Insurance schemes	P-value
	n (%)	n (%)	
Age (Years)			0.100
Below 35	5 (4.0)	119 (96.0)	
35–54	4 (6.0)	63 (94.0)	
55 and above	2 (20.0)	8 (80.0)	
Sex			0.956
Male	5 (5.4)	88 (94.6)	
Female	6 (5.6)	102 (94.4)	
Marital Status			0.912
Married	4 (5.7)	66 (94.3)	
Unmarried	7 (5.3)	124 (94.7)	
Education			0.483
No formal education	1 (5.3)	18 (94.7)	
Primary	4 (3.8)	102 (96.2)	
Secondary and above	6 (7.9)	70 (92.1)	
Occupation			< 0.001
Unemployed	1 (2.7)	36 (97.3)	
Self employed	4 (2.6)	149 (97.4)	
Government	6 (54.6)	5 (45.4)	
Awareness on Insurance scheme presence			0.370
No	0 (0.0)	13 (100.0)	
Yes	11 (5.9)	177 (94.1)	
Chronic illness status			< 0.001
No	5 (2.6)	188 (97.4)	

Characteristics	Proportions of participants enrolled in the Insurance schemes n (%)	Proportions of participants NOT enrolled in the Insurance schemes n (%)	P-value
Yes	6 (75.0)	2 (25.0)	
Influence of Family size on joining insurance			0.758
No	7 (5.9)	112 (94.1)	
Yes	4 (4.9)	78 (95.1)	
Premiums affordability			0.004
No	1 (1.0)	103 (99.0)	
Yes	10 (10.3)	87 (89.7)	
Quality of service			0.132
Poor	9 (7.4)	112 (92.6)	
Good	2 (2.5)	78 (97.5)	

3.3 Factors associated with non-enrollment in health insurance schemes

Non-enrollment factors among residents of Mlimba District Council in 2025 (N = 201).

In the multivariable Modified Poisson regression analysis with robust variance estimation, Only government employment and chronic illness status were independently not associated with non-enrollment in health insurance schemes. Participants who were government employed had a significantly lower prevalence of non-enrollment compared with unemployed participants (adjusted prevalence ratio [aPR] = 0.53; 95% confidence interval [CI]: 0.29–0.96; $p = 0.036$). Similarly, participants with a chronic illness were significantly less likely to be not enrolled in an insurance scheme compared with those without chronic illness (aPR = 0.28; 95% CI: 0.09–0.90; $p = 0.033$) (Fig. 3). Other socio-demographic, economic, awareness, household, or service-related variables remained not statistically significant after adjustment, meaning that they had high statistical significance of non-enrollment after adjustment (Refer Table 3).

Table 3

Multivariable Modified Poisson regression for factors associated with Insurance scheme non-enrollment in Mlimba District council, 2025 (N = 201)

Characteristics	Prevalence of NOT being enrolled n (%)	Crude Prevalence Ratio (95%CI)	P-value	Adjusted Prevalence ratio (95% CI)	P-Value
Age					
Below 35	119 (96.0)	Ref		Ref	
35–54	63 (94.0)	0.98 (0.91–1.05)	0.570	1.00 (0.95–1.05)	0.868
55 and above	8 (80.0)	0.83 (0.61–1.14)	0.254	1.03 (0.88–1.20)	0.757
Sex					
Male	88 (94.6)	Ref		Ref	
Female	102 (94.4)	1.00 (0.93–1.07)	0.956	1.00 (0.96–1.05)	0.948
Marital status					
Married	66 (94.3)	Ref		Ref	
Unmarried	124 (94.7)	1.00(0.94–1.08)	0.913	1.00 (0.96–1.04)	0.965
Education level					
No formal education	18 (94.7)	Ref		Ref	
Primary	102 (96.2)	1.02 (0.91–1.14)	0.786	1.02 (0.97–1.07)	0.492
Secondary and above	70 (92.1)	0.97 (0.86–1.10)	0.659	1.02(0.98–1.07)	0.326
Occupation					
Unemployed	36 (97.3)	Ref		Ref	
Self employed	149 (97.4)	1.00(0.94–1.06)	0.976	1.01 (0.98–1.04)	0.473
Government employed	5 (45.4)	0.47(0.24–0.90)	0.022	0.53 (0.29–0.96)	0.036
Awareness to insurance schemes					
No	13 (100.0)	Ref		Ref	

Characteristics	Prevalence of NOT being enrolled n (%)	Crude Prevalence Ratio (95%CI)	P-value	Adjusted Prevalence ratio (95% CI)	P-Value
Age					
Yes	177 (94.1)	0.94 (0.91–0.98)	0.001	0.95 (0.88–1.03)	0.191
Chronic illness status					
No	188 (97.4)	Ref		Ref	
Yes	2 (25.0)	0.26 (0.08–0.86)	0.027	0.28 (0.09–0.90)	0.033
Influence of Family size on joining insurance					
No	112 (94.1)	Ref		Ref	
Yes	78 (95.1)	1.01 (0.95–1.08)	0.755	0.99 (0.95–1.03)	0.584
Premiums affordability					
No	103 (99.0)	Ref		Ref	
Yes	87 (89.7)	0.91 (0.84–0.97)	0.006	0.98 (0.95–1.01)	0.294
Quality of service					
Poor	112 (92.6)	Ref		Ref	
Good	78 (97.5)	1.05 (1.0-1.12)	0.098	0.0.99 (0.96–1.01)	0.303

4 DISCUSSION

The key factors for non-enrollment include employment status and chronic illness status. Government-employed participants and those with chronic illnesses had a significantly lower prevalence of non-enrollment compared with unemployed participants and those without chronic illnesses, respectively. Other factors were not significantly associated with non-enrollment after adjustment.

The high level of health insurance non-enrollment in Mlimba District Council highlights persistent gaps in financial protection and access to health insurance, particularly among populations engaged in the informal sector and those living in rural settings. Among the few participants who were insured, enrollment was reported through schemes such as the National Health Insurance Fund (NHIF) and the

improved Community Health Fund (iCHF), indicating that existing insurance mechanisms have yet to achieve broad and equitable population coverage. Despite the transition toward mandatory enrollment under the Universal Health Insurance (UHI) framework, the findings raise important concerns regarding the effective implementation and enforcement of the reform, particularly in reaching and retaining informal-sector and rural populations who may face greater financial and geographical barriers to enrollment. If these gaps persist, a substantial proportion of the population may continue to rely on out-of-pocket payments when seeking healthcare, increasing their vulnerability to financial hardship and catastrophic health expenditure and potentially slowing progress toward achieving Universal Health Coverage.(13) In light of the Universal Health Insurance Act, these findings are particularly significant. While the Act introduces mandatory enrollment to address low coverage, the evidence suggests that legal enforcement alone may not overcome deeply rooted socioeconomic constraints. Similar patterns across Sub-Saharan Africa show that exclusion is largely driven by structural inequalities rather than individual choice, especially among rural and informal populations.(15),(14)

Employment status emerged as a key structural determinant of health insurance non-enrollment. Formal-sector workers benefit from stable income and payroll-based contribution systems, while self-employed and unemployed individuals face exclusion due to irregular earnings and lack of institutional support. This confirms that non-enrollment is structurally driven rather than purely behavioral.(16) In the context of the Insurance Act, these findings point to a critical implementation requirement. To achieve universal coverage, the Act must move beyond uniform contribution models and incorporate flexible payment options tailored to informal-sector populations, alongside targeted subsidies for low-income groups. Without adapting to income variability and employment realities, the policy risks maintaining the same enrollment gaps it seeks to eliminate.(17)

Chronic illness was associated with higher likelihood of insurance enrollment, indicating that perceived healthcare need is a strong driver of uptake. Individuals living with chronic conditions often anticipate frequent medical visits and costs, making insurance a rational financial protection strategy. This pattern is consistently reported in LMICs, where those with higher expected healthcare utilization are more inclined to enroll. However, this also reflects a demand-driven enrollment pattern that can lead to adverse selection. When enrollment is concentrated among individuals who are already ill, while healthier individuals delay or avoid joining, the insurance pool becomes skewed toward high-risk members. This increases overall costs and can undermine the financial sustainability of the scheme(18).

In the context of the Universal Health Insurance Act, these findings highlight a critical implementation issue. Although the Act mandates universal enrollment, its success will depend on ensuring that both healthy and high-risk individuals are enrolled early and consistently. Without broad participation, the system risks replicating adverse selection patterns seen in voluntary schemes, weakening its ability to provide sustainable financial protection.(19)

Variables, including age, sex, marital status, education level, awareness of insurance schemes, household size, affordability, and perceived quality of services, were highly independently associated

with non-enrollment after adjustment(20, 21) This suggests that individual socio-demographic characteristics and awareness alone are insufficient to drive insurance uptake in the presence of strong structural and economic barriers. the influence of socio-demographic and perceptual factors appears limited in structurally constrained settings. Another paper reported that variables such as education, age, and sex often lose significance after adjusting for structural determinants, suggesting that individual characteristics alone are insufficient to drive non-enrollment.(22) However, the persistence of these determinants suggests that legal obligation alone may not be sufficient to ensure effective enrollment. Older adults, less educated individuals, and those with limited awareness may continue to face informational and cognitive barriers, while affordability remains a critical constraint for large households and low-income groups.

Moreover, perceived poor quality of services remains a key discouraging factor, meaning that even under a mandatory system, individuals may comply formally but remain disengaged in practice or seek alternative care. This highlights that successful implementation of the Universal Health Insurance Act of Tanzania will require more than enforcement; it must be accompanied by improved health service quality, targeted public awareness, and financial protection measures for vulnerable groups.

Suppressing non-enrollment will require targeted strategies such as flexible contributions for informal-sector workers, integration of non-enrollment with community and government programs, and measures to attract low-risk and younger populations to strengthen risk pooling(23). These insights provide actionable evidence for policymakers and program designers aiming to improve coverage and advance universal health coverage in similar rural and semi-urban contexts.

Overall, the findings indicate that health insurance coverage in Mlimba District and similar settings in Tanzania is predominantly shaped by structural factors and healthcare needs rather than demographic or perceptual attributes. Expanding coverage will require system-level interventions, including flexible contribution mechanisms tailored to informal-sector populations, integration of non-enrollment within community and institutional structures, and targeted strategies to attract younger and low-risk individuals. Such approaches are essential to strengthen risk pooling, enhance financial protection, and accelerate progress toward Universal Health Coverage. From a policy perspective, the findings are consistent with broader health systems evidence.(24) The World Health Organization (WHO) (2010) has emphasized that voluntary insurance schemes are unlikely to achieve Universal Health Coverage without strong government intervention and mandatory participation mechanisms which have to be mandatory addressed especially in rural areas where there is high vulnerable people. Supporting this, a study was done and it identified the exclusion of informal-sector populations as a major obstacle to expanding coverage, advocating for flexible and subsidized contribution models(25)

5 STRENGTHS AND LIMITATIONS

This study provides strong, context-specific evidence on health insurance coverage in a rural Tanzanian setting, addressing an important gap in localized data for advancing Universal Health Coverage. The

community-based design enhances representativeness by including both healthcare users and non-users, thereby reducing facility-based selection bias and improving external validity within similar rural populations. Methodologically, the use of modified Poisson regression with robust variance estimation strengthens the analytical rigor by providing accurate and interpretable measures of association for a common outcome. In addition, the multistage sampling approach improves population representation, while electronic data collection using Kobo Collect enhances data quality, completeness, and consistency.

However, several limitations should be considered. The cross-sectional design restricts the ability to establish causal relationships, limiting interpretation to associations only. The reliance on self-reported data introduces the possibility of recall and social desirability biases, particularly for subjective variables such as awareness, affordability, and perceived service quality. The study's focus on a single rural district may also limit generalizability to other settings, especially urban or more diverse populations. Furthermore, the relatively small sample size in certain subgroups may have reduced statistical power to detect some associations, and residual confounding cannot be entirely excluded due to unmeasured variables such as detailed income levels or health system factors.

6. CONCLUSION

The findings of this study should be interpreted in light of Tanzania's recent health financing reforms under the Universal Health Insurance Act. While the Act establishes a legal framework for mandatory insurance coverage, the results from Mlimba District suggest that structural and socioeconomic barriers remain significant determinants of non-enrollment. Factors such as low income, limited education, and rural residence continue to constrain uptake, indicating that legislation alone may not be sufficient to achieve universal coverage.

The persistence of low awareness and affordability challenges highlights a critical implementation gap. For the Act to achieve its intended outcomes, complementary strategies will be required, including targeted community education, premium subsidies for low-income households, and improved accessibility of non-enrollment services. Without these measures, there is a risk that mandatory insurance could exist in principle but remain ineffective in practice, particularly among vulnerable populations.

At the health system level, the success of the Universal Health Insurance Act will also depend on improvements in service quality. The findings reinforce existing evidence that perceived poor quality of care strengthens non-enrollment. Strengthening healthcare infrastructure, ensuring consistent availability of medicines, and improving patient experience are therefore essential to build public trust and sustain participation in the insurance system.

Overall, this study provides timely district-level evidence that can inform the operationalization of Tanzania's mandatory insurance policy. By highlighting the gap between policy intent and local realities,

the findings emphasize the need for context-specific implementation strategies to ensure that the goals of universal health coverage are effectively realized.

Abbreviations

Abbreviations	Meaning
CHF	Community Health Fund
iCHF	improved Community Health Fund
LMICs	Low Middle Income Countries
MoH	Ministry of Health
NHIF	National Health Insurance Fund
OOP	Out of Pocket
SSA	Sub-Saharan Africa
UHC	Universal Health Coverage
WHO	World Health Organization

Declarations

Acknowledgement

We are grateful for Mlimba District Council for granting administrative permission to conduct the study.

Author contributions

“E.S.N. led the development of the study manuscript, including drafting the original version and contributing to the overall interpretation of the research findings, he was also responsible for data analysis and contributed to the interpretation of the results. J.R.N. provided critical review, editing, and valuable input to improve the scientific quality and clarity of the manuscript. A.K. provided supervision, guidance throughout the research process, and ensured the overall quality and direction of the study. Other authors contributed to data collection, participated in discussions on the findings, and reviewed the manuscript for important intellectual content. All authors reviewed and approved the final version of the manuscript and agreed to be accountable for the work.”

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

The datasets generated and/or analyzed during the current study are not publicly available because they contain information collected from human participants and are subject to confidentiality and ethical restrictions. De-identified data may be available from the corresponding author upon reasonable request, subject to applicable ethical and data-protection requirements.

Ethics approval

Ethical approval for this study was obtained from the St. Francis University College of Health and Allied Sciences Institutional Review Board (SFUCHAS IRB), Tanzania, prior to commencement of the study. The study was conducted in accordance with applicable ethical principles for research involving human participants. Administrative permission to conduct the study was obtained from Mlimba District Council.

Consent to participate

Written informed consent was obtained from all participants before participation in the study. Participants were informed about the purpose of the study, the voluntary nature of participation, the confidentiality of the information provided, and their right to decline participation or withdraw from the study without penalty.

Consent for publication

All authors have read and approved the final version of the manuscript and consent to its publication.

Competing interests

The authors declare no competing interests.

Open Access

This article is published under open access license, allowing unrestricted access, reading, downloading, distribution and reuse of the work, provided that appropriate credit is given to the original authors. The authors retain copyright of the work and agree to its distribution under the Creative Commons Attribution 4.0 International (CC BY 4.0)

References

1. Galárraga O, Sosa-Rubí SG, Salinas-Rodríguez A, Sesma-Vázquez S. Health insurance for the poor: impact on catastrophic and out-of-pocket health expenditures in Mexico. *Eur J Health Econ*. 2010;11(5):437–47. 10.1007/s10198-009-0180-3.
2. Kim J, Richardson V. The Impact of Poverty, Chronic Illnesses, and Health Insurance Status on Out-of-Pocket Health Care Expenditures in Later Life. *Soc Work Health Care*. 2014;53(10):932–49. 10.1080/00981389.2014.955940.

3. Abdilwohab MG, Abebo ZH, Godana W, Ajema D, Yihune M, Hassen H. Factors affecting enrollment status of households for community based health insurance in a resource-limited peripheral area in Southern Ethiopia. Mixed method. Telfair J, editor. PLOS ONE. 2021;16(1):e0245952. 10.1371/journal.pone.0245952
4. Tessema ZT, Worku MG, Tesema GA, Alamneh TS, Teshale AB, Yeshaw Y, et al. Determinants of accessing healthcare in Sub-Saharan Africa: a mixed-effect analysis of recent Demographic and Health Surveys from 36 countries. *BMJ Open*. 2022;12(1):e054397. 10.1136/bmjopen-2021-054397.
5. Durizzo K, Harttgen K, Tediosi F, Sahu M, Kuwawenaruwa A, Salari P, et al. Toward mandatory health insurance in low-income countries? An analysis of claims data in Tanzania. *Health Econ*. 2022;31(10):2187–207. 10.1002/hec.4568.
6. Sustainability of the National Health Insurance Scheme of Ghana. - ProQuest [Internet]. [cited 2025 Dec 6]. Available from: <https://www.proquest.com/openview/2b17769aaf07ec374b61dac2d10bf831/1?pq-origsite=gscholar&cbl=18750&diss=y>
7. Barasa E, Kazungu J, Nguhiu P, Ravishankar N. Examining the level and inequality in health insurance coverage in 36 sub-Saharan African countries. *BMJ Glob Health*. 2021;6(4):e004712. 10.1136/bmjgh-2020-004712.
8. Amani PJ, Hurtig AK, Frumence G, Kiwara AD, Goicolea I, San Sebastián M. Health insurance and health system (un) responsiveness: a qualitative study with elderly in rural Tanzania. *BMC Health Serv Res*. 2021;21(1):1140. 10.1186/s12913-021-07144-2.
9. Binyaruka P, Mtei G, Maiba J, Gopinathan U, Dale E. Developing the improved Community Health Fund in Tanzania: was it a fair process? *Health Policy Plan*. 2023;38(Supplement1):i83–95. 10.1093/heapol/czad067.
10. Parmar D, Souares A, De Allegri M, Savadogo G, Sauerborn R. Adverse selection in a community-based health insurance scheme in rural Africa: Implications for introducing targeted subsidies. *BMC Health Serv Res*. 2012;12(1):181. 10.1186/1472-6963-12-181.
11. Macha J, Kuwawenaruwa A, Makawia S, Mtei G, Borghi J. Determinants of community health fund membership in Tanzania: a mixed methods analysis. *BMC Health Serv Res*. 2014;14(1):538. 10.1186/s12913-014-0538-9.
12. Umeh CA. Challenges toward achieving universal health coverage in Ghana, Kenya, Nigeria, and Tanzania. *Int J Health Plann Manage*. 2018;33(4):794–805. 10.1002/hpm.2610.
13. Tanzania-UHI-Act-2023-Policy-brief.
14. Amu H, Dickson KS, Adde KS, Kissah-Korsah K, Darteh EKM, Kumi-Kyereme A. Prevalence and factors associated with health insurance coverage in urban sub-Saharan Africa: Multilevel analyses of demographic and health survey data. Sharma GA, editor. PLOS ONE. 2022;17(3):e0264162. 10.1371/journal.pone.0264162
15. Berkowitz SA, Gold R, Domino ME, Basu S. Health insurance coverage and self-employment. *Health Serv Res*. 2021;56(2):247–55. 10.1111/1475-6773.13598.

16. Doctor of Public Health Study Program, Faculty of Public Health, Indonesia U, Depok, Indonesia, Ainy A, OF HEALTH INSURANCE ENROLLMENT FOR THE INFORMAL SECTOR IN LOW AND MIDDLE-INCOME COUNTRIES. Faculty of Public Health, Universitas Sriwijaya, Indralaya, Indonesia, Pujiyanto, Department of Health Policy and Administration, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia. DETERMINANT : A SYSTEMATIC REVIEW. In: Proceedings of The International Conference on Public Health [Internet]. The International Institute of Knowledge Management; 2023 [cited 2026 Apr 23]. pp. 37–52. Available from: <https://tiikmpublishing.com/data/conferences/doi/icoph/10.1750124246735.2022.7204.pdf> doi:10.17501/24246735.2022.7204
17. Wamalwa PN, Strupat C, Singh K, Kuloba MN, Kazungu J, De Allegri M. Who remains uncovered? Assessing inequalities and determinants of national health insurance enrolment among informal sector workers in Kenya. *Glob Health Res Policy*. 2025;10(1):62. 10.1186/s41256-025-00461-7.
18. Plugge E, Cole D. Oxford graduates' perceptions of a global health master's degree: a case study. *Hum Resour Health*. 2011;9(1):26. 10.1186/1478-4491-9-26.
19. Andersen MS. Effects of Medicare coverage for the chronically ill on health insurance, utilization, and mortality: Evidence from coverage expansions affecting people with end-stage renal disease. *J Health Econ*. 2018;60:75–89. 10.1016/j.jhealeco.2018.06.002.
20. Taddesse G, Atnafu DD, Ketemaw A, Alemu Y. Determinants of enrollment decision in the community-based health insurance, North West Ethiopia: a case-control study. *Glob Health*. 2020;16(1):4. 10.1186/s12992-019-0535-1.
21. Atinga RA, Abihiro GA, Kuganab-Lem RB. Factors influencing the decision to drop out of health insurance enrolment among urban slum dwellers in Ghana. *Trop Med Int Health*. 2015;20(3):312–21. 10.1111/tmi.12433.
22. Corazzini AJ, Dugan DJ, Grabowski HG. Determinants and Distributional Aspects of Enrollment in U.S. Higher Education. *J Hum Resour*. 1972;7(1):39. 10.2307/145056.
23. Carrin G, Waelkens M, Criel B. Community-based health insurance in developing countries: a study of its contribution to the performance of health financing systems. *Trop Med Int Health*. 2005;10(8):799–811. 10.1111/j.1365-3156.2005.01455.x.
24. Debie A, Khatri RB, Assefa Y. Successes and challenges of health systems governance towards universal health coverage and global health security: a narrative review and synthesis of the literature. *Health Res Policy Syst*. 2022;20(1):50. 10.1186/s12961-022-00858-7.
25. Okungu V, Chuma J, Mulupi S, McIntyre D. Extending coverage to informal sector populations in Kenya: design preferences and implications for financing policy. *BMC Health Serv Res*. 2018;18(1):13. 10.1186/s12913-017-2805-z.

Figures

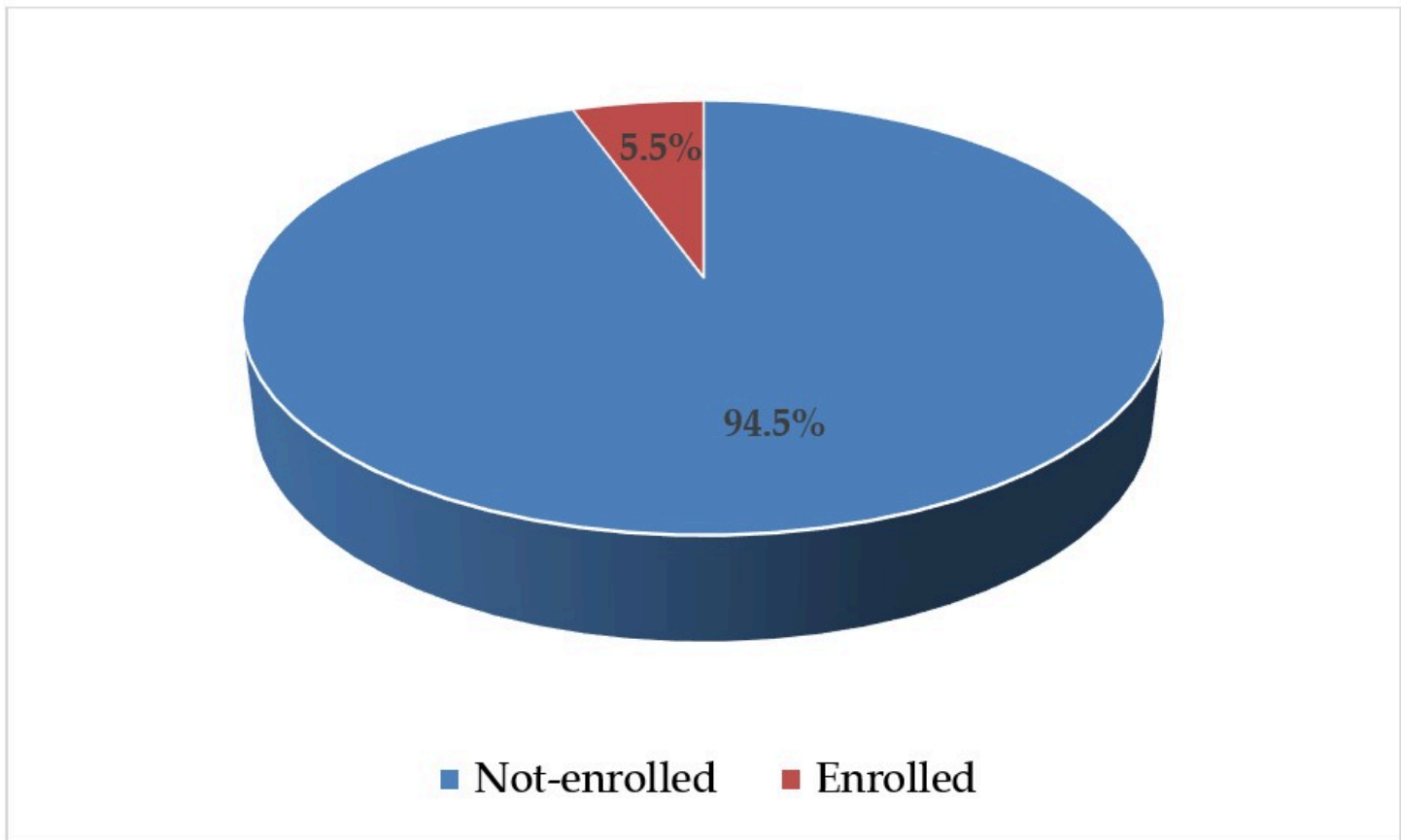


Figure 1

Proportion of individual's non-enrollment

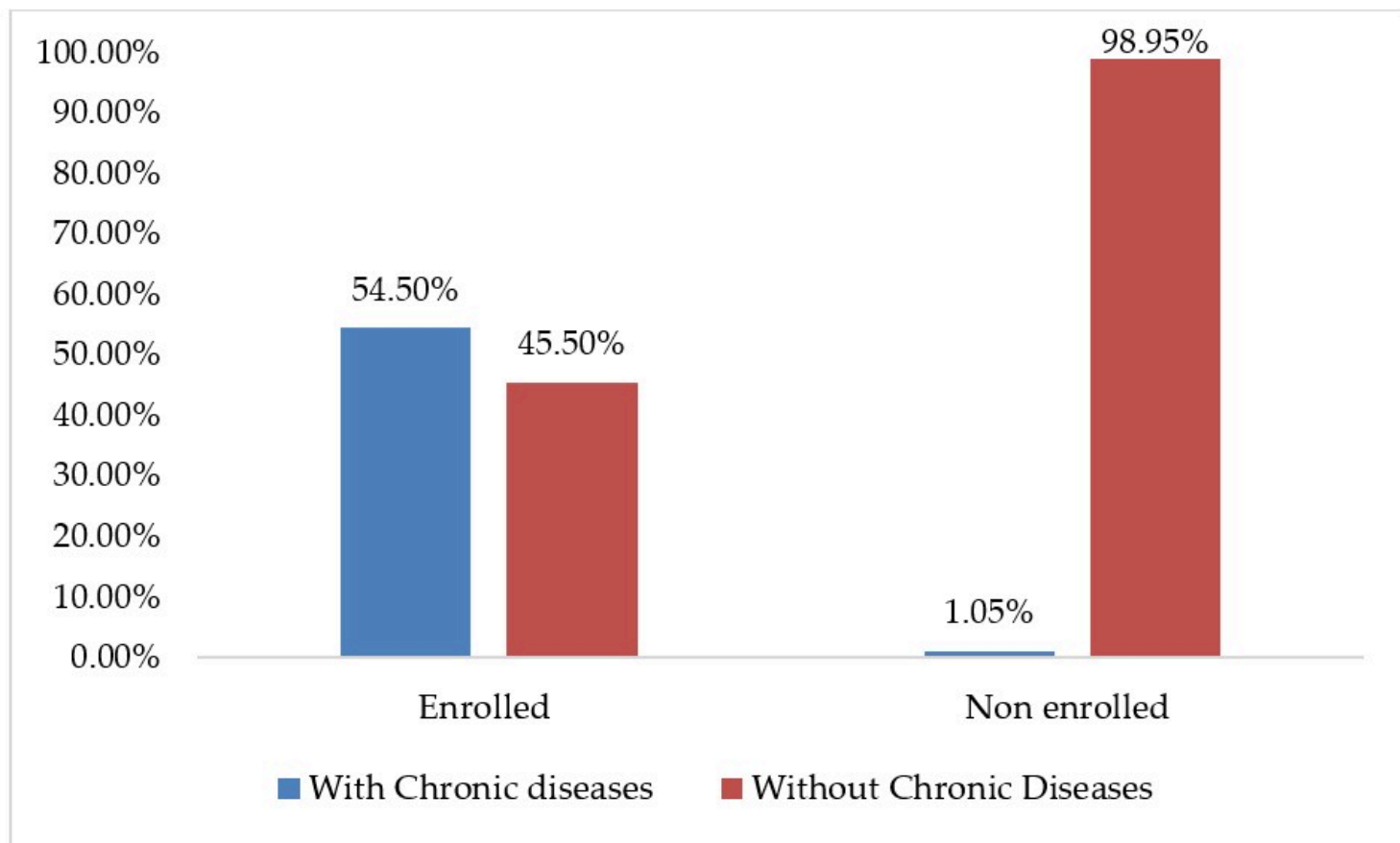


Figure 2

Figure 3: Non-enrollment status of individuals with and without chronic illness