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ORIGINAL RESEARCH

Health Insurance Coverage and Its Associated Factors Among Reproductive-Age Women in East Africa: A Multilevel Mixed-Effects Generalized Linear Model

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Background: Despite improvement in access to modern healthcare services in East African countries, health-service delivery and health status of the population remained poor mainly due to the weak health-sector financing system. Therefore, the current study aimed to assess the health insurance coverage and its associated factors among reproductive-age group (RAG) women in East Africa.

Methods: The most recent (between 2010 and 2018) Demographic and Health Surveys (DHS) data of the ten East African countries (Burundi, Comoros, Ethiopia, Kenya, Malawi, Mozambique, Tanzania, Uganda, Zambia, and Zimbabwe) were included. STATA version 16.0 statistical software was used for data processing and analysis. In the multilevel mixed-effects generalized linear model, variables with a p-value ≤0.05 were declared as significant associated factors of health insurance coverage.

Results: The overall health insurance coverage in East Africa was 7.56% (95% CI: 7.42%, 7.77%). The odds of health insurance coverage were high among educated, currently working, and rich RAG women whereas it was low among rural residents. Besides, RAG women who have media exposure, visited by field workers, and visited health facilities have a higher chance of health insurance coverage.

Conclusion: Health insurance coverage in East Africa among RAG women was below ten percent. Educational status, working status, place of residence, wealth index, media exposure, visiting health facility within 12 months and being visited by field worker were significantly associated with health insurance coverage among RAG women in East Africa. Improving women's access to health facilities, promoting field workers' visit, and media exposure targeting uneducated, unemployed, and rural resident women of RAG will be a gateway to promote health insurance coverage.

Keywords: health insurance coverage, reproductive age group, Eastern Africa, DHS

Background

Globally, over 930 million people spend at least 10% of their household income on health care and about 100 million people are pushed into extreme poverty each year because of out-of-pocket spending on health.[1] To provide financial protection against such catastrophes, developing countries in recent years are increasingly implementing health insurance systems to increase access to health care.[2,3] Health insurance is a way of providing financial protection against health

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care costs with the objectives of ensuring financial sufficiency, risk pooling, and effective purchasing.[4,5] Accordingly, it helps in ensuring a balance between population health investments and health care finance, and is recognized to be the prevailing method to achieve universal health coverage.[5] While there are different models of health insurance, the commonly used health insurance models in eastern Africa include community-based health insurance, social health insurance, private health insurance, fee-waivers, and exemption.[6]

Reproductive age group women's ability to access affordable coverage and care has important implications for society and it depends on economic benefits for women and their families.[7,8] However, the coverage of healthcare services among RAG women remained Low- and middle-Income countries (LMIC) with financial constraints as a major barrier.[9,10] Furthermore, poor quality of health-care services at public service providers and the absence of pre-payment financial arrangements for health care were major factors for lower utilization of health care services.[11] To date, for reproductive services, health insurance is attracting more and more attention in such countries as a means of improving health care utilization and protecting against impoverishment from out-of-pocket expenditures.[2,12,13]

Previous local and national studies conducted elsewhere reported, factors like demographic and socioeconomic factors, community participation, illness experience, benefit package, awareness level, previous out of pocket expenditure for health care service and health service status (quality, adequacy, efficiency and coverage), premium amount, self-rated health status and bureaucratic complexity were identified to determine the utilization of health insurance.[14] Besides, according to the theory of demand for health insurance, perceived value of the premium, moral hazard, adverse selection, and cost of insurance are important predictors of premium utilization.[15]

Despite improvement in access to modern healthcare services in East African countries, health-service delivery and health status of the the RAG remained low mainly due to the low level of health-sector financing and lack of access to health insurance by women.[13,16] Moving away from out-of-pocket (OOP) payments for health care at the time of use to pre-payment (health insurance) is an important step towards averting the financial hardship associated with paying for health-care services.[11] However, large scale evidences supporting this fact is lacking. Besides, previous local and national studies conducted in the region addressed specific types of insurance on small scale using small sample size and weak analysis modality. Furthermore, there are no published literatures addressed in the coverage of health insurance at the regional level (east Africa). Thus, to fill the existing gap the current study aimed to assess the coverage of health insurance and its associated factors among RAG women in East Africa using Demographic and Health Survey (DHS) data. The finding of the current study provides evidence for health planners, programmers, and health professionals to improve financial protection and service utilization of RAG women.

Methods
Data Source and Extraction
The current study used the most recent Demographic and Health Surveys (DHS) data of the ten East African countries (Burundi, Comoros, Ethiopia, Kenya, Malawi, Mozambique, Tanzania, Uganda, Zambia, and Zimbabwe). Data on all interviewed women aged 15–49 were extracted from the individual Record (IR file) data set. Ten East African countries were included, with surveys conducted between 2010 and 2018 (Table 1).

Sample Design and Sampling Weights
Demographic and Health Surveys sample designs were two-stage probability samples selected from the most recent census frame. In the first stage of selection, the primary sampling units (census enumeration areas) were drawn with probability proportional to size within each stratum. The primary sampling units formed the survey cluster. In the second stage, a complete household listing

Table 1 List of East African Countries, Their Sample Size and Year of the Survey Included in the Analysis

County Name	Weighted Sample Size	Year of the Survey
Burundi	17,269	2016–17
Ethiopia	15,683	2016
Comoros	5319	2012
Kenya	14,620	2014
Malawi	24,562	2015–16
Mozambique	13,745	2011
Tanzania	13,266	2015–16
Uganda	18,506	2016
Zambia	13,684	2018
Zimbabwe	9955	2015

was done in each of the selected clusters (primary sampling units). Then, a fixed number of households were taken by equal probability systematic sampling in the selected cluster. In this study, individual weights for women, primary sampling unit and strata were used to achieve a national representation of women living in East Africa. Accordingly, a total weighted sample of 146,609 women aged 15–49 was included in the study.

Study Variables

The dependent variable in the present study was health insurance coverage. The DHS asked RAG women whether they are covered by health insurance and the type of health insurance by which they are covered. We, accordingly, constructed a dichotomous measure of health insurance coverage. By considering the binary nature of the outcome variable, it was coded as 1 if RAG women were covered by social security or other employer-based insurance or any of the health insurance schemes or mutual health organization or community-based insurance or privately purchased commercial insurance, otherwise it was coded as 0. After reviewing different works of literature[16–23] age, marital status, educational level, currently working, place of residence, country, wealth index, sex of head of household, age of household head, media exposure, visited by a fieldworker in the last 12 months, visited a health facility in the last 12 months, and cigarette smoking were considered as independent variables.

Data Processing and Statistical Analysis

STATA version 16 statistical software was used for data processing and analysis. Before any statistical analysis, the data were weighted by sampling weight, primary sampling unit and strata. The study population was explained using cross-tabulations and summary statistics. Both fixed and mixed effects were fitted (to take into account the clustered nature of DHS data) and compared using Akaike and Bayesian Information Criteria (AIC and BIC).[24] A mixed effect model (multilevel mixed-effects generalized linear model) with the lowest Information Criteria (AIC and BIC) was selected. The variances between clusters were quantified by Intra-cluster Correlation Coefficient (ICC), and it was found to be greater than 0.10. Variables with a p-value ≤0.05 were declared significant factors for health insurance coverage among RAG women.

Results

A total of 146,609 RAG women from 10 East African countries were included in the analysis. More than one-

fifth (21.8%) of the participants were in the age group of 15–19 years. More than three-fifths of them were married (61.8%) and were currently working (64.2%). Regarding educational status and place of residence, 19.50% and 70.93% of the study participants were uneducated and from rural areas, respectively.

Malawi is a country with the highest proportion of study participants (16.75%) followed by Uganda (12.62%), and Burundi (11.78%), whereas Comoros has the lowest proportion of the study participants (3.63%). More than two-thirds (67.27%) of the women reported that they had media exposure and 36.09% are poor. Regarding cigarette smoking behavior, almost all, 99.27% were non-smokers. About 60.11% of the participants have visited health facilities and 12.6% were visited by field workers (Table 2).

Health Insurance Coverage

As indicated in Figure 1 below, the overall prevalence of health insurance coverage in East Africa was 7.56% (95% CI: 7.42%, 7.77%). The highest prevalence was from Burundi (21.77%) and Kenya (18.13%), whereas the lowest was from Uganda (1.38%) and Malawi (1.55%).

Factors Associated with Health Insurance Coverage

From the total of 13 variables considered in the multi-variable analysis model, age of mother, marital status, educational status, working status, place of residence, country of residence, wealth index, sex of the household head, media exposure, visiting a health facility in the last 12 months, and being visited by a field worker were significantly associated with health insurance coverage among RAG women in East Africa (Table 3).

The odds of health insurance coverage decreased by 37% among women aged 20–24 years as compared to those aged 15–19 years (AOR = 0.63, 95% CI: 0.57, 0.69). On the other hand, the odds of health insurance coverage were 1.38, 1.54, 1.79 and 1.76 times higher among women aged 30–34, 35–39, 40–44 and 45–49 years compared to women of the age group of 15–19 years (AOR = 1.38, 95% CI: 1.24, 1.54), (AOR = 1.54, 95% CI: 1.37, 1.74), (AOR = 1.79, 95% CI: 1.58, 2.03), and (AOR = 1.76, 95% CI: 1.54, 2.02), respectively.

Health insurance coverage was lower by 45% and 48%, respectively among never married and formerly married women of RAG in East Africa (AOR =0.55, 95% CI:

Table 2 Characteristics of Respondents for the Study on Health Insurance Coverage Among Reproductive-Age Group Women in East Africa Countries, 2021

Variables	Weighted Frequency	Percent
Age in years		
15–19	31,962	21.80
20–24	28,038	19.12
25–29	25,088	17.11
30–34	21,128	14.41
35–39	17,514	11.95
40–44	12,953	8.84
45–49	9926	6.77
Marital status		
Never married	38,581	26.31
Currently married	90,658	61.84
Formerly/ever married	17,370	11.85
Level of education		
No formal education	28,609	19.50
Primary	70,267	47.93
Secondary	40,510	27.63
College and above	7223	4.94
Currently working		
No	52,486	35.80
Yes	94,123	64.20
Place of residence		
Urban	42,623	29.07
Rural	103,986	70.93
Country		
Burundi	17,269	11.78
Ethiopia	15,683	10.70
Comoros	5319	3.63
Kenya	14,620	9.97
Malawi	24,562	16.75
Mozambique	13,745	9.38
Tanzania	13,266	9.05
Uganda	18,506	12.62
Zambia	13,684	9.33
Zimbabwe	9955	6.79
Wealth index		
Poor	52,916	36.09
Middle	27,610	18.84
Rich	66,083	45.07
Sex of household head		
Male	100,843	68.78
Female	45,766	31.22

(*Continued*)

Table 2 (Continued).

Variables	Weighted Frequency	Percent
Age of the household head in years		
15–19	1311	0.89
20–24	8807	6.01
25–29	17,408	11.87
30–34	20,612	14.06
35–39	22,188	15.13
40–44	20,687	14.12
45–49	18,002	12.28
≥ 59	37,594	25.64
Cigarette smoking		
No	145,539	99.27
Yes	1070	0.73
Media exposure		
No	47,985	32.73
Yes	98,624	67.27
Visited by fieldworker in last 12 months		
No	128,123	87.40
Yes	18,474	12.60
Visited health facility last 12 months		
No	58,482	39.89
Yes	88,112	60.11

0.50, 0.60) and (AOR = 0.52, 95% CI: 0.47, 0.56) compared to those married during the time of the survey. The odds of health insurance coverage were 1.23, 2.71, and 12.56 times higher among women who attended primary, secondary, and higher (tertiary) level of education (AOR = 1.23, 95% CI: 1.13, 1.33), (AOR = 2.71, 95% CI: 2.47, 2.97), and (AOR = 12.56, 95% CI: 11.18, 14.12) as compared to participants with no formal education, respectively.

Working status at the time of the survey was another variable which was significantly associated with health insurance coverage among RAG women. Accordingly, women who are working were 1.34 times more likely to have health insurance as compared to those who are not working at the time of the survey (AOR = 1.34, 95% CI: 1.26, 1.43). The odds of health insurance coverage were lower by 13% among
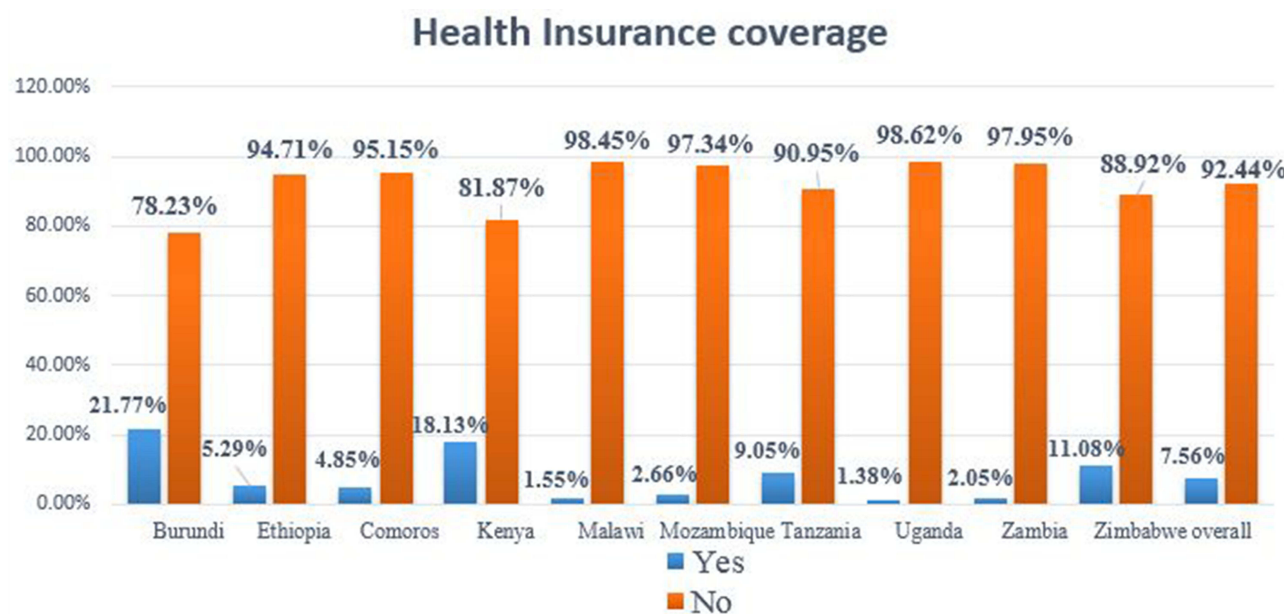
Figure 1 Health insurance coverage among women of reproductive aged group in East African countries, 2021.

women from rural areas (AOR = 0.87, 95% CI: 0.79, 0.96) as compared to those residing in an urban area.

The odds of health insurance coverage were lower by 95% (AOR = 0.05, 95% CI: 0.04, 0.07), 93% (AOR = 0.07, 95% CI: 0.06, 0.09), 70% (AOR = 0.30, 95% CI: 0.27, 0.35), 99% (AOR = 0.01, 95% CI: 0.01, 0.02), 95% (AOR = 0.05, 95% CI: 0.04, 0.06], 83% (AOR = 0.17, 95 CI: 0.14, 0.20), 99% (AOR = 0.01, 95% CI: 0.01, 0.02), 98% (AOR = 0.02, 95% CI: 0.01, 0.03) and 88% (AOR = 0.12, 95% CI 0.10, 0.14) among women from Ethiopia, Comoros, Kenya, Malawi, Mozambique, Tanzania, Uganda, Zambia and Zimbabwe respectively as compared to women from Burundi.

The odds of health insurance coverage were 1.76 and 3.47 times more likely among RAG women in middle and rich wealth index quintiles (AOR = 1.76, 95% CI: 1.61, 1.92) and (AOR = 3.47, 95% CI: 3.20, 3.77) compared to those in poor wealth index quintiles, respectively. The likelihoods of health insurance coverage were 1.14 times higher in a situation where females are household heads (AOR = 1.14, 95% CI: 1.07, 1.21) compared to where males are household heads.

Women who had media exposure were 1.44 times more likely (AOR = 1.44, 95% CI: 1.34, 1.55) to have health insurance as compared to those who had no media exposure. The odds of health insurance were 1.14 times higher among women visited by field workers in 12 months preceding the survey (AOR= 1.14, 95% CI: 1.04, 1.24]

compared to those not visited by field workers. Women who visited health facilities in 12 months preceding the survey were 1.38 times more likely (AOR = 1.38, 95% CI: 1.31, 1.47) to have health insurance compared to those who did not visit health facilities within 12 months preceding the survey.

Discussion

Health insurance coverage among RAG women provides greater financial access to timely care and is a key strategy to achieve universal health coverage.[25] In the current study, we examined the prevalence and factors associated with health insurance coverage among RAG women in East African countries.

The results of our study showed that the overall prevalence of health insurance coverage among RAG in East Africa was 7.56%, with cross-country variations where the highest prevalence was observed in Burundi (21.77%) and the lowest was found in Uganda (1.38%). The possible reason for this discrepancy might be due to the difference in domestic health expenditure per Gross Domestic Product (GPD) and premium payment method.[26]

The findings of this study revealed that RAG women who are single had low health insurance coverage as compared to married ones. This finding was consistent with studies conducted elsewhere.[16–18] This is because single women may not afford the premiums, deductibles, and have low perceived illness. According to the current

Table 3 Bi-Variable and Multivariable Analysis of Health Insurance Coverage Among Reproductive-Age Group Women in East Africa, 2021

Variables	Health Insurance Coverage		Odds Ratio [95% CI]		P-value
	Yes	No	COR	AOR	
Age					
15–19	1591	30,371	1	1	
20–24	1410	26,628	1.01 [0.92, 1.09]	0.63 [0.57, 0.69]	<0.001
25–29	2025	23,063	1.79 [1.65, 1.93]	0.96 [0.86, 1.06]	0.400
30–34	2052	19,076	2.45 [2.26, 2.65]	1.38 [1.24, 1.54]	<0.001
35–39	1740	15,774	2.48 [2.29, 2.70]	1.54 [1.37, 1.74]	<0.001
40–44	1311	11,642	2.59 [2.37, 2.82]	1.79 [1.58, 2.03]	<0.001
45–49	953	8973	2.39 [2.17, 2.64]	1.76 [1.54, 2.02]	<0.001
Marital status					
Currently married	7549	83,109	1	1	1
Never married	2671	35,910	2.08 [1.97, 2.20]	0.55 [0.50, 0.60]	<0.001
Formerly/ever married	862	16,508	1.05 [0.96, 1.15]	0.52 [0.47, 0.56]	<0.001
Educational level					
Uneducated	1821	26,718	1	1	
Primary	3295	66,972	1.07 [0.99, 1.15]	1.23 [1.13, 1.33]	<0.001
Secondary	3768	36,742	2.07 [1.91, 2.24]	2.71 [2.47, 2.97]	<0.001
Higher	2198	5025	12.20 [10.99, 13.55]	12.56 [11.18, 14.12]	<0.001
Currently working					
No	2308	50,177	1	1	
Yes	8772	85,350	1.94 [1.83, 2.05]	1.34 [1.26, 1.43]	<0.001
Place of residence					
Urban	4623	38,000	1	1	
Rural	6459	97,527	0.30 [0.27, 0.34]	0.87 [0.79, 0.96]	0.006
Country					
Burundi	3759	13,510	1	1	
Ethiopia	830	14,853	0.06 [0.05, 0.08]	0.05 [0.04, 0.07]	<0.001
Comoros	258	5061	0.13 [0.10, 0.17]	0.07 [0.06, 0.09]	<0.001
Kenya	2650	11,970	0.49 [0.43, 0.57]	0.30 [0.27, 0.35]	<0.001
Malawi	380	24,182	0.02 [0.02, 0.03]	0.01 [0.01, 0.02]	<0.001
Mozambique	365	13,380	0.06 [0.05, 0.08]	0.05 [0.04, 0.06]	<0.001
anzania	1200	12,066	0.21 [0.18, 0.25]	0.17 [0.14, 0.20]	<0.001
Uganda	256	18,250	0.02 [0.02, 0.03]	0.01 [0.01, 0.02]	<0.001
Zambia	281	13,403	0.03 [0.02, 0.04]	0.02 [0.01, 0.03]	<0.001
Zimbabwe	1103	8852	0.29 [0.24, 0.35]	0.12 [0.10, 0.14]	<0.001
Wealth index					
Poor	1686	51,230	1	1	
Middle	1603	26,007	2.05 [1.88, 2.23]	1.76 [1.61, 1.92]	<0.001
Rich	7793	58,290	2.05 [1.88, 2.23]	3.47 [3.20, 3.77]	<0.001
Sex of head of household					
Male	7746	93,097	1	1	
Female	3336	42,430	0.95 [0.91, 1.01]	1.14 [1.07, 1.21]	<0.001

(*Continued*)

Table 3 (Continued).

Variables	Health Insurance Coverage		Odds Ratio [95% CI]		P-value
	Yes	No	COR	AOR	
Age of head of household					
15–19	35	1276	1	1	
20–24	366	8441	1.32 [0.89, 1.96]		
25–29	1192	16,216	1.99 [1.35, 2.90]	1.30 [0.86, 1.98]	0.209
30–34	1670	18,942	2.34 [1.60, 3.43]	1.48 [0.98, 2.22]	0.059
35–39	1923	20,265	2.54 [1.73, 3.72]	1.46 [0.98, 2.18]	0.066
40–44	1689	18,998	2.41 [1.65, 3.54]	1.48 [0.99, 2.21]	0.057
45–49	1671	16,331	2.56 [1.75, 3.76]	1.44 [0.96, 2.15]	0.078
≥ 59	2536	35,058	1.77 [1.21, 2.60]	1.34 [0.89, 1.99]	0.157
Cigarette smoking					
No	10,999	134,540	1	1	
Yes	83	987	0.96 [0.72, 1.26]	1.01 [0.75, 1.35]	0.959
Media exposure					
No	2139	45,846	1	1	
Yes	8943	89,681	2.36 [2.22, 2.52]	1.44 [1.34, 1.55]	<0.001
Visited by fieldworker in last 12 months					
No	10,042	118,081	1	1	
Yes	1039	17,435	1.14 [1.05, 1.23]	1.14 [1.04, 1.24]	0.004
Visited health facility last 12 months					
No	3115	55,367	1	1	
Yes	7966	80,146	1.82 [1.73, 1.91]	1.38 [1.31, 1.47]	<0.001

study, participants who engaged in some types of job were positively associated with better coverage of health insurance. This finding was similar to studies done in Ethiopia[19] and Kenya.[18,20] This is because employed participants can able to pay the regular contribution for health insurance premium required for enrolment.

In this study, relatively older RAG women were more likely to have health insurance as compared to the youngers. Other studies have also reported a direct relationship between maternal age and health insurance coverage.[16,18,19,21] This similarity might be due to the fact that as age increases the risk of getting illness increases; thus, the chance of health insurance coverage will increase.[27] Consistent with previous studies,[16,19,20,22,23] there is a positive relationship between educational status and health insurance coverage among RAG women. This positive association might have occurred because education enhances access to information and high-income, occupations tend to offer insurance and income provides the means to pay insurance premiums.

The current study documented that the odds of health insurance coverage among RAG women in middle and rich wealth index were higher compared to poor wealth index. These findings were similar to a study done at national level in Ethiopia.[19] This might be due to the association of income with the utilization of health insurance premium.[28] Other studies,[6] however, recorded lower odds of health insurance coverage among women from wealthier households (SSA). This might be explained by wealthier women are likely to use private health facilities, due to the quality of healthcare provided.[29]

Besides, our findings revealed that health insurance coverage was lower among RAG women from rural areas compared to their urban counterparts. This finding is in line with the different studies conducted elsewhere.[16,21,23] A plausible explanation for these findings could be that less information access and media exposure about health insurance among rural dweller RAG women. Furthermore, the present study recorded that RAG women who had media exposure were more likely to utilize the health insurance as compared to their

counterparts. This finding is similar to a study done in Ghana,[18] Ethiopia,[19] Kenya,[18] and Sub-Saharan Africa.[16] The possible explanation could be media exposure play a crucial role in disseminating information and increasing awareness about the importance of health insurance. Besides, the current study identified a strong association between health insurance coverage and health facility visits and being visited by field workers. Thus, media is another getaway to create awareness about health insurance for RAG women.

As a strength, the current study used nationally representative data of ten East Africa countries and an advanced model that considered the clustered nature of that data. However, some East African countries were not included in this study because of the absence of DHS data or data related to health insurance. This might be a limit to conclude our finding for all East African counties. Since the present study used secondary data, some important variables such as perceived need for health care, the presence of degenerative diseases and other special health conditions that can affect health insurance coverage were included in this study.

Conclusion

Health insurance coverage in East Africa among RAG women was below ten percent. The highest prevalence was from Burundi and the lowest was from Uganda. The odds of health insurance was higher among old aged (30–49 years), educated, currently working and rich RAG women, but it was low among rural residents. Besides, RAG women who have media exposure, were visited by field workers, and have visited health facilities have a higher chance of utilizing health insurance. Improving women's access to health facilities, promoting field workers' visits, and media exposure targeting young, unemployed, poor, and rural RAG women will be a gateway to improve the coverage of health insurance among RAG women in East Africa.

Abbreviations

AIC, Akaike Information Criteria; AOR, adjusted odds ratio; BIC, Bayesian Information Criteria; CBHI, Community Based Health Insurance; CI, confidence interval; DHS, Demography health survey; GLMM, Generalized Linear Mixed Models; ICC, Intra-cluster Correlation Coefficient; IR, Individual Record; LMIC, Low and Middle Income; RAG, Reproductive Aged group; SSA, Sub-Saharan Africa.

Data Sharing Statement

All necessary informations were included with the manuscript.

Ethics Approval and Consent to Participate

Up on our request to DHS Program, permission was approved by 153701 reference number to download and use the data for this study from http://www.dhsprogram.com. There are no individual identifiers reported in any part of this manuscript. All the data management and analysis were conducted according to the manuals of DHS.

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Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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