

Socio-economics Correlates of Malaria Preventive Measures: A Comparative Study of Tanzania and Malawi

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ABSTRACT In Sub-Saharan Africa, Malaria remains a critical public health issue, a major cause of mortality among the people. Hence, the study examines socio-economic correlates of Malaria preventive measures in Tanzania and Malawi. Using secondary data from 2007/2008 HIV/Malaria Survey, Tanzania and 2012 Malaria Indicator Survey, Malawi, seemingly unrelated bivariate Probit regression was used to estimate the correlates of Malaria preventive measures in these countries. It is worth noting that in the two countries, relative difference in the use of Malaria prevention measures stills exists. For instance, in Tanzania, women predominantly use mosquito bednets than either insecticides spray or coils as compared to Malawi's women. Furthermore, women residing in rural areas of both countries are less likely to use malaria preventive measures extensively. Therefore, accelerating interventions aimed at improving the adoption of malaria preventive practices among underserved communities is imperative if meaningful public health dividends are to be realized in both Tanzania and Malawi.

INTRODUCTION

Malaria remains one of the greatest public health challenges which has claimed to date between 700 000 and 2.7 million people around the world (WHO 2023). The report further reiterates that out of these, 75 percent are from sub-Saharan Africa. Over time, scholars have postulated that low socioeconomic status among populations, particularly in developing countries, has significantly contributed to a higher malaria mortality burden. This is largely due to the more severe physiological impact of Plasmodium infection on poorer individuals compared to their wealthier counterparts. (Furtado et al. 2023; Sonibare et al. 2022; Milner et al. 2020).

In view of this development, developing countries of Tanzania and Malawi among others embarked and adopted numerous initiatives aimed at reducing the spread of the vector *plasmodium Falciparum* and *plasmodium Vivax*, vectors that have become resistant to Malaria preventive drugs (Makenga et al. 2023; Matowo et al. 2023). Among the initiatives established in Tanzania include: National voucher scheme of 2004, under-five coverage campaign in the year 2010 and universal coverage campaign in 2011. Such initiatives have been implemented in order to improve the health wellbe-

ing of the people in general terms. However, due to increased cases of malaria deaths, in recent years Tanzania conducted a scaled-up exercise to understand issues on malaria diagnosis, drug's efficacy, vector control, vaccine and safe individual initiative in the fighting and preventing of spread of malaria in the country (Winkler et al. 2025; Davies et al. 2026; Alegana et al. 2021). Yet, the effectiveness of malaria prevention and fight is lowly noticed despite report of availability of cost-effective malaria preventive measures in most developing countries (WHO 2023). In Malawi, similar preventive strategies were launched and adopted due to increased number of deaths over the time (Ojo et al. 2026).

Nevertheless, initiatives such as Roll-Back-Initiatives emphasized the significance of using multifaceted, affordable and accessible preventive measures to prevent malaria vector from spreading (Birkett et al. 2025; Moiroux et al. 2025). Additionally, such global initiatives were supplemented by country specific malaria strategic plans' aimed at reducing malaria related deaths targeting at risk-population in Tanzania and Malawi (Winkler et al. 2025; Ojo et al. 2026). Despite demonstrated policy initiatives, the current malaria prevention products and utilization rates remain disappointingly far from reaching a universal stance. Recent studies indicate Tanzania and Malawi malaria preven-

tive products utilization rate stood between 25-49 percent and 50-75 percent among the at-risk population respectively (Messenger et al. 2023; Mtove et al. 2023; WHO 2023).

Therefore, the study specifically investigated the cross-country correlates of malaria preventive measures in Tanzania and Malawi. Secondly considering the existence of different preventive methods on malaria such as mosquito nets, insecticides spray and coil defined as outcome variables, the study explored the within country differentials in usage of these methods. Finally, the researchers aspired to understand the correlates of each preventive method by country of study. Recent reports indicate that Tanzania and Malawi invested an average of about US\$ 64.5 million and US\$ 21.5 million, respectively, in the fight against malaria alone (WHO 2023). Despite such targeted health care expenditure, malaria remains a public health challenge affecting the state of good healthy well-being among people in Tanzania and Malawi. Therefore, the study investigated factors associated with the choice of malaria preventive practices in Tanzania and Malawi.

METHODOLOGY

Study Area and Population

The study used data obtained from ICF-MACRO database: the 2007/2008 HIV/AIDS and malaria data for Tanzania and the 2012 Malaria Indicator Survey for Malawi (ICF-Macro 2015). The surveys interviewed 10,968 and out of which 10,507 were reported to be using malaria preventive measures in which 9879 used mosquito nets, 361 used insecticides spray and 267 coils. Likewise in Malawi, 2,283 women were involved in a survey and 1,328 women were reported to be using malaria preventive measures in which 1,183 adopted mosquito nets, 63 adopted insecticide spray and 72 were using coils. However, even though the data used in the study was collected at different time points, the data sets remained not only the most recent source of malaria data but also comprised of variables that necessitated hypotheses tested in the study.

Study Design

Data were collected by ICF MACRO for individual women with experiences in preventing ma-

laria for their households in Tanzania and Malawi for the year 2007/08 and 2012 respectively. These women were selected based on their capability of using three preventive measures in malaria control such as using nets, insecticide sprays and coils in their household. The data was collected as part of the ICF-MACRO project to keep abreast the malaria information for these countries in Africa.

Variables and Measures

As indicated above, three outcome variables were used and these were usage of mosquito nets which was coded as 1 if the woman used and 0 otherwise, insecticides spray that was coded 1 if the woman used the insecticide spray and 0 otherwise and usage of coil in the household coded 1 if the woman used the coil within the household and 0 otherwise. The three outcome variables were subjected to the following explanatory variables. Age of the respondents defined as “<25”, “25-34” and “35+”. Educational Status defined as “no education”, “primary”, “secondary and above” levels. Furthermore, women place of residence was categorised as rural and urban. Number of living children was classified as “less or equal to 3” and “at least 4 children”. Wealth status was recoded according to women belonging to three classes namely: poor, middle and the rich. Women access to malaria information was defined as adequate if the women get adequate information above 75 percent quartile, moderate if they obtained information on an average scale of 50 percent and inadequate if the women received information below the 25 percent lower quartile. These categories were obtained using Principal Components Analysis (PCA), which was used to develop the factors and defined them as such. In case of Malawi, only two factors were derived due to absence of the third factor in loading. The variables used to come up with the index include: information from government hospital, community workers, family peers, work place, radio drama, peer educators and newspapers. Likewise, knowledge of risks associated with malaria was derived using PCA approach. The variables used to compute the index include: respondents heard about danger of malaria, that malaria can kill, mosquito spread malaria, importance of sanitation within the households. The limitation of this study is that it does not take into account household level variables. This was not

feasible because household-level variable had very little number of cases in Malawi.

Statistical Analysis

The study used bivariate analytical approach to explain the relationship between the explanatory variables and each outcome variable. This was achieved by computing usage rate of each outcome variable for all explanatory variables and represented per 1000 women. Additionally, a binary logistic regression models was used to analyse Tanzania dataset. For Malawi, a negative binomial regression technique was used to account for over dispersed number of zero's on each outcome variables due to fewer cases reported to use malaria preventive products. The coefficients were reported using odds ratio. The collinearity check of the variables was done using variable inflation factor and variable with lower inflation value less than 30 were included in the accompanying models' iterations.

The p-value ≤ 0.05 was used to check the significance of the association between explanatory variables and each outcome variable.

RESULTS

Respondent's Usage Rate of Malaria Preventive Products by Their Characteristics

Table 1 illustrates a utilization rate of mosquito nets, insecticide sprays and coils by respondent's characteristics for Tanzania and Malawi. As is indicated in the Table 1, Tanzania dominates Malawi on mosquito net usage per 1000 women across their entire characteristics considered in the study. However, comparing the two countries, it is observed that use of coil and spray has mixed results. Whilst middle aged women (25-34) use all three preventive measures than other ages, those with secondary education dominated use of coil. As expected, urban women used preventive measure

Table 1: Malaria preventive measures usage by respondents characteristics in Tanzania and Malawi

Usage rate per 1000 women	Tanzania			Malawi		
	Net	Spray	Coil	Net	Spray	Coil
<i>Age of Respondents</i>						
<25	879.8	25.9	21.8	548.9	24.5	24.5
25-34	915.4	36.6	28.3	486.8	29.2	36.5
35+	893.8	35.3	19.8	543.7	29.1	32.1
<i>Educational Status</i>						
No education	820.7	14.5	14.2	423.4	14.6	7.3
Primary	920.2	31.9	20.5	545.9	16.7	25.6
Secondary	971.2	22.3	71.2	515.3	54.1	75.3
<i>Place of Residence</i>						
Urban	968.6	90.6	57.7	467.9	15.1	90.3
Rural	888.4	22.3	18.2	536.4	61.1	20.2
<i>Number of Living Children</i>						
<3	861.0	36.9	29.8	525.7	31.8	39.1
≥ 4	893.4	29.1	19.1	506.7	21.1	20.1
<i>Wealth Status</i>						
Poor	860.9	14.1	12.1	492.6	22.7	12.2
Middle	895.6	33.5	23.6	564.4	26.9	17.6
Rich	952.2	55.5	39.8	487.2	36.5	83.9
<i>Malaria Information</i>						
Adequate	877.8	25.5	19.5	287.4	52.9	65.0
Moderate	929.7	45.6	34.6			
Inadequate	905.5	31.8	21.8	712.6	13.2	19.6
<i>Risks Knowledge of Malaria</i>						
Low	876.1	31.8	21.2	624.7	34.6	30.3
Moderate	944.1	31.0	22.2	496.6	18.8	39.1
High	979.2	57.1	74.3	420.1	27.6	24.4
Aggregate usage (percentage)	9897(100%)	361(100%)	267(100%)	1183(100%)	63(100%)	72(100%)

Source: 2007/08 HIV/AIDS Malaria and 2012 Malaria Indicator Survey Data for Tanzania and Malawi respectively

much more than the rural women but it is striking to note that Malawian rural women use spray than their urban counterparts.

On the same note in Tanzania, the rich women use all three methods than other women. In Malawi, the rich women dominate in using spray and coil and not mosquito net. Surprisingly, Malawian women with inadequate knowledge on malaria use mosquito nets than any other category. Further to this, women with low understanding of risks associated with malaria have higher rates of mosquito nets and insecticide spray utilization pattern.

Socio-economic Correlates Influencing Malaria Preventive Measures in Tanzania and Malawi

There is need to understand the correlates of malaria prevention from a multivariate perspective

in the countries of study. Based on Table 2, the models show that explanatory variables considered were at least found to be significantly related to one or more preventive measures, except for number of living children in Tanzania. Additionally, various conflicting odds ratios were observed between the two countries. For instance, whilst women aged 25-34 are found to be significantly and more likely to use mosquito nets, in Tanzania compared to those aged under 25, it is opposite scenario in Malawi. Furthermore, women that attained secondary education are significantly less likely to use insecticide spray than those with no education. In Tanzania, this was contrary. Likewise, women belonging to middle income were found to be more likely and significantly use insecticide spray relative to the poor in Tanzania. Similarly, women from the same category were less

Table 2: Multivariate regression results of correlates influencing malaria prevention practices in Tanzania and Malawi

<i>Dependent outcome models</i>	<i>Malaria prevention practices</i>					
	<i>Tanzania</i>			<i>Malawi</i>		
	<i>Net</i>	<i>Spray</i>	<i>Coil</i>	<i>Net</i>	<i>Spray</i>	<i>Coil</i>
<i>Independent Variables</i>	<i>OR</i>	<i>OR</i>	<i>OR</i>	<i>OR</i>	<i>OR</i>	<i>OR</i>
<i>Age</i>						
<25 ^R						
25-34	1.47**	1.32	1.01	0.72**	0.86	1.21
35 +	1.30	1.30	0.89	0.99	1.13	1.63
<i>Education</i>						
No Education ^R						
Primary	2.08***	1.14	0.70	1.34**	0.38	0.45**
Secondary	4.56***	1.93**	1.69	1.29	0.91	0.57
<i>Place of Residence</i>						
Urban ^R						
Rural	0.59**	0.22***	0.35***	1.14	0.16***	0.05***
<i>Living Children</i>						
<3 ^R						
1-3	1.03	1.08	1.01	0.93	0.44**	0.39**
<i>Wealth Status</i>						
Poor ^R						
Middle	1.18	1.69**	1.61	1.19	0.50**	0.32***
Rich	1.76***	1.01	1.31	0.91	0.18***	0.35**
<i>Malaria Information</i>						
Inadequate ^R						
Moderate	4.76***	0.07***	0.05***			
Adequate	4.52***	0.05***	0.03***	1.3**	1.21	1.72**
<i>Risks Knowledge of Malaria</i>						
Low ^R						
Medium	2.08***	0.95	1.14	0.77**	0.37***	0.95
High	4.13***	0.91	2.19**	0.83	0.57**	0.61

Hint: ** significant at $p < 0.05$, *** $P < 0.001$; R =Reference category

Source: 2007/08 HIV/AIDS Malaria and 2012 Malaria Indicator Survey for Tanzania and Malawi

likely to use insecticide spray over the poor women. Regarding malaria information, those with adequate information are more likely to use mosquito coils in Malawi over those with inadequate access to malaria information. However, similar group of women were less likely in Tanzania. Further, women with moderate and high-risk knowledge of malaria were more likely and significantly influence use of mosquito nets in Tanzania. However, a similar category of women were found to be less likely yet significantly associated with mosquito net usage in Malawi.

At a country level specific perspective, women aged 25-34 years, educational attainment above primary, those from richest society, access to malaria information and ever had knowledge on malaria risks were more likely and significantly related to mosquito nets use in Tanzania. Nonetheless, women resident in rural were significantly and less likely to use mosquito nets in the same country. Besides, secondary level attainment or higher in education and women from middle class in societies were significantly and more likely to use insecticide spray. Surprisingly, access to malaria information and women resident in rural areas were found to be less likely and significantly affect use of insecticide spray in Tanzania. Regarding coil Model in Tanzania, women secondary attainment, those from middle income society and have higher risk knowledge of Malaria were more likely and significantly use mosquito coil. On the contrary, resident in rural areas and unexpectedly access to information about malaria less likely and significantly influence mosquito coils usage in Tanzania.

In Malawi, women with at least primary education, belonging to middle income society and inadequately access information about malaria were significantly and more likely use mosquito nets. On the same, women age 25-34 years and have medium knowledge about risk of malaria were less likely and significantly use mosquito coils relative to each indicator's reference category. In insecticide spray model, women residing in the rural, with at least 4 living children in a household, belonging middle class and above yet had moderate understanding on risk of malaria were significantly and less likely to use insecticides spray. Regarding mosquito nets model, only those women with adequate access to malaria information more likely use coil where as women with primary education, resident in the rural, with at least 4 living children and were at

least belonging to middle income societies were less likely and significantly use mosquito coil in Malawi.

Within country results indicate rural Tanzania to be less likely to use all malaria preventive methods. However, with an exception of mosquito net usage, the rural in Malawi found to have similar result to that of Tanzania. On another aspect, it is worthy to note that women with primary education are less like to use coils relative to those with no education. However, the same women were found to be more likely to use mosquito nets relative to those without education. In Tanzania, having at least 4 living number of children more likely, yet, insignificantly affect use of all malaria preventive methods. On the contrary, the same was found to be less likely with significantly influencing use of insecticide sprays and mosquito coils in Malawi.

DISCUSSION

The aim of the paper was to investigate correlates differences influencing malaria prevention in Tanzania and Malawi. Using binary regression and negative binomial approaches to estimate factors associated with malaria prevention, diverse dimensions affecting malaria prevention still persists across Tanzania and Malawi. In Tanzania, the scaling up of mosquito nets usage initiative through Presidential Malaria Initiatives that was launched in 2005, promoted use of mosquito nets in Mainland Tanzania greatly (91%) (PMI 2015). An earlier study in Tanzania posits lack of universal subsidization on mosquito net cost affect its usage levels more importantly among the underserved rural women (Messenger et al. 2023; Makenga et al. 2023). Additionally, economic challenges experienced by the people in most developing countries including Tanzania and Malawi which account for an increased vulnerability risk of dying of malaria (John et al. 2024; Saflo et al. 2023; Mosha et al. 2022). For instance, in Tanzania, out of pocket payment for an individual's health stood at a mean of 54.3 percent between 2010 and 2013. Among Malawians, willingness to pay for individual's own health slightly declined from 27.5 percent in 2010 to about 23.5 percent in 2013. It is not inconceivable and deniable fact that such differences in people's willingness at household levels to have a bearing affecting usage levels of preventive healthcare products among them: mosquito nets, insecticides spray and coils (World Bank 2023).

Furthermore, women education attainments above primary education was more likely and correspondingly similar on the use mosquito nets. Yet, the countries were observed to have mixed usage pattern regarding insecticide sprays and coils. Earlier studies postulated that scaling up challenges in education among societies in order to have a direct impact not only on health-seeking behaviour to malaria prevention (Winkler et al. 2025; Ruiz-Castillo et al. 2022), but also improved communications among people with regards to the consequences of Malaria (Kiuru et al. 2023).

In another aspect, the two countries' economy is reportedly growing at different levels over the past years which are reported to have an impact on not only the quality of nutritional life, but also quality of health care choices and expenditures (World Bank 2023; Mangani et al. 2022). For instance, World Bank reported Tanzania's economy shift from 6.4 percent in 2010 to 7.4 percent in 2013 while 6.5 percent in 2010 down to 5.0 percent in 2013 for Malawi. Such economic development more profoundly was found to have an effect in health care prevention between Tanzania and Malawi. For example, women from the middle-income societies were found to be more likely to use insecticides sprays and coils in Tanzania relative to the poor counterpart. However, such similar women were less likely to use insecticide sprays and coils in Malawi. Therefore, it is undeniable fact that negative economic growth of Malawi corresponds and to have a bearing on quality of health care delivery which in turn negatively affect health outcome in the country.

On the other hand, women resident in rural Tanzania and Malawi were significantly and less likely to use insecticide sprays and coils. However, an earlier study hypothesized that to rural women challenge to access quality of care affects their willingness to seek modern health care services (Ojo et al. 2026; Marascia et al. 2023). This catalysed by low socioeconomic and cultural barriers experienced by women in rural outside their household purview create challenges affecting preventive healthcare adoption practice (John et al. 2024; Behera 2022; Du et al. 2022). In Malawi, use of preventive measures to fight Malaria is almost similar. For instance, with an exception of mosquito net adoption, the country's determinants are less likely affecting usage of insecticides spray and coils. Previous studies argue that differences in

sociodemographic, social structures, cultural beliefs affect health seeking behaviour among people in developing countries (Moiroux et al. 2025; Marascia et al. 2023; Ritter et al. 2021). In Malawi, related found inadequate information about the risk associated with Malaria has subsequent negative effect on Malaria preventive practice in rural areas (Hargrove et al. 2022; Cohee et al. 2022).

In Tanzania, a previous study postulates that community campaigns related to risk of Malaria not only increased retreatment of mosquito nets in Bagamoyo district in Tanzania, but also improved health outcome among the people in the districts (Birkett et al. 2025; Messenger et al. 2023). Additionally, a similar study found in rural setting found that low socioeconomic statuses among communities more likely make suffer parasitemic, a condition which increase their vulnerability risk on malaria morbidity (Langat et al. 2026; Soe et al. 2026; Mategula et al. 2024; Oxborough et al. 2024). As such, malaria-related health-seeking behaviours, such as bed net retreatment and insecticide spraying, remain the most likely predictors for reducing malaria endemicity in some parts of Tanzania (Marascia et al. 2023). However, at national level, this present study found some contradictory findings from the rural perspectives in Tanzania and Malawi. It is a conceivable fact that increased health seeking behaviours that include malaria preventive practices, related positively to health outcome. In an earlier study, it is postulated that overcoming barriers towards health care services accessibility and affordability among the rural and marginalized communities have an impetus to appreciate service utilization (Saflo et al. 2023; Ritter 2021). These defined aspects negatively impact extensive initiatives and practices associated with malaria prevention in the countries of study.

CONCLUSION

In Tanzania, mosquito net is the predominant method that a lot of people are using to prevent Malaria as compared to use of insecticides and coils as compared to Malawi. However, in Tanzania, women in the rural areas are consistently less likely to use all preventive measures considered in controlling malaria. Likewise, women in the rural are less likely to use insecticide spray and coils in Malawi. In another aspect, educational attainment increases the likelihood of using mosquito nets

both countries of studies. Additionally, conflicting results exist regarding use of insecticide sprays and coils between the two countries. For instance, women adequate access to Malaria information most likely decreases the odds of using mosquito coils in Tanzania contrary to Malawi. In Tanzania, the higher the women understand the risks of Malaria, the more likely they use mosquito coils, which is contrary to Malawi's situation.

RECOMMENDATIONS

Therefore, based on the afore-presented conclusions, the need for consistent and pro-community-based efforts and interventions to support socioeconomic challenges still affecting Malaria Preventive practices enhancement in Tanzania and Malawi. This is imperative if and only if both countries' public health and epidemiological strides are to be sustainably attained while containing Malaria and its dire effect to the communities', thus, making them Malaria free countries.

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