# SOCIO-ECONOMIC STATUS AND PREVALENCE OF MALARIA IN SELECTED URBAN AND RURAL AREAS OF KOGI STATE, NIGERIA

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## ABSTRACT
This study employed a descriptive survey research design with a quantitative approach to investigate the relationship between socioeconomic status and the prevalence of malaria in designated urban and rural areas of Kogi State, Nigeria. The research utilized a randomly selected population, employing questionnaires for data collection. Data analysis involved simple tabulation, percentages, frequency distribution, and binary logistic regression. The results indicated that higher education is associated with a decrease in malaria prevalence, suggesting the importance of educational initiatives. However, certain occupations, particularly farming, are linked to increased malaria risk, necessitating occupational health and safety measures. Additionally, higher income levels are associated with increased malaria prevalence, highlighting the need for policies addressing healthcare access for lower-income individuals. The study recommends promoting higher education, targeted awareness campaigns, occupational health measures for farmers, and policies improving healthcare access and income diversification to mitigate malaria prevalence in Kogi State, among others were proffered.

**Keywords:** Socioeconomic Status, Malaria Prevalence, Income Level, Occupation, Binary Logistic Regression, Kogi State.

**JEL Classification:** I10, I18, I25, J24, O15

## 1. INTRODUCTION
The global prevalence of malaria is intricately tied to socioeconomic factors, with substantial variations in income and access to resources across countries (World Bank, 2023b). Socioeconomic status is shaped by factors like economic growth, poverty levels, and education (Worrall, Basu & Hanson, 2003). Disparities are evident in indicators like education, healthcare access, and living conditions, particularly in developing countries (U.S. Bureau of Economic Analysis, 2018; Will & Michael, 2020). African nations, including Nigeria, face challenges related to resource access, education, healthcare, and economic opportunities, leading to high poverty rates and inequality (OECD, 2022). Nigeria, the largest economy in Africa, exhibits

significant socioeconomic disparities, impacting health outcomes (World Bank, 2022a; Ifeanyi, 2019).

Malaria, affecting 40% of the world's population, is a major health concern, with the majority of cases concentrated in sub-Saharan Africa (WHO, 2023). Nigeria bears a significant burden, with notable impacts on healthcare and economic growth (Nitin, 2021). Despite progress, challenges persist, especially in maternal and child health (WHO, 2022). Malaria's prevalence in Nigeria, particularly in Kogi State, contributes to high infant mortality rates and poses a significant public health challenge (National Bureau of Statistics, 2023; Gabriel, Clement, Udeme, Joshua, & Lucky, 2020). The link between socioeconomic factors and malaria prevalence in Kogi State is crucial for designing effective interventions (Yahya, Grace & Olufemi, 2016).

Individuals with higher socioeconomic status experience lower malaria incidence due to resource access, while lower-income individuals face a higher risk due to limited preventive measures (NCREL, 2010; World Bank, 2023a). Kogi State has implemented measures to reduce malaria, but challenges persist due to cultural beliefs, political instability, and socioeconomic disparities (Oyibo, Audu, Ajibade & Odiba, 2020a/2020b; Hauwa, 2021). Existing research highlights the association between socioeconomic status and malaria prevalence in Nigeria, emphasizing poor health services and housing conditions (Abdullahi, Ogbalu & Shigaba, 2020; Amana, 2010). However, there is a gap in understanding how specific socioeconomic factors influence malaria prevalence in Kogi State, such as education, occupation, and income (Mohammed, Adewumi & Mokuolu, 2016; Oyibo et al., 2020b).

This study aims to fill this gap by investigating the socioeconomic factors associated with malaria prevalence in Kogi State, focusing on education, occupation, and income. The research aims to provide valuable insights into the burden of malaria in Kogi State and its relationship with socioeconomic status, addressing the critical need for understanding the overall health of the population. The subsequent sections include a literature review, theoretical framework, methodology, discussion of results, conclusion, and recommendations.

## 2. LITERATURE REVIEW

### 2.1 Theoretical Review

The Socioeconomic Status (SES) theory, a sociological framework, explores the impact of an individual's social and economic standing on various life aspects, emphasizing income, occupation, and education. Rooted in the Social Stratification Theory, it posits hierarchical societal structures, as discussed by Max Weber (1922) and Karl Marx (1867). Influenced by James S. Coleman's work, SES theory extends to health inequalities, child-rearing practices (Lareau), crime rates, political participation, and occupational attainment (Coleman, 1966). Pickett and Wilkinson (2015) link income inequality to health outcomes. The Human Capital model incorporates SES theory, examining education's role in shaping socioeconomic status. Criticisms prompt the Health Production Theory, acknowledging health's multifaceted determinants. The Health Production Function (HPF) theory (Grossman, 1972) focuses on inputs like personal and medical care investments, genetics, and environment shaping health outcomes. It has been critiqued for oversimplification, leading to the Human Capital theory's extension. Despite criticisms, HPF theory informs evidence-based strategies for health and well-being.

Human Capital Theory, pioneered by Gary Becker (1964), posits investments in education, training, and health enhance economic outcomes. It links health to labor productivity and economic development. While criticized for oversimplification, it underscores the significance

of health in human capital. Demographic Transition Theory explains population dynamics and socioeconomic development stages (Thompson, 1929). It outlines four stages: Pre-transition, Early transition, Late transition, and Post-transition. The theory relates to infant mortality rates, impacting healthcare and socioeconomic development. Studies in India and Iran support the theory's association with declining infant mortality rates. Despite criticism for oversimplification, the theory provides empirical evidence for the relationship between demographic transition and improved infant health.

**2.2 Empirical Review**

Anjorin, Okolie & Yaya (2023) This study analyzes the impact of socioeconomic factors on malaria prevalence in under-five children across 11 Sub-Saharan African countries using 2010-2020 Demographic and Health Survey data. Key findings reveal a 24.2% malaria prevalence, increasing with age. Significant factors include maternal education, household wealth, and region. Children of mothers with secondary education show a 56% lower risk, while those in the richest households have a 73% lower risk compared to the poorest, emphasizing the crucial role of maternal education in predicting malaria prevalence in this context. Affiah, Fadoju, James, James, Uzoma, Opada & Jasini (2022) assessed the economic implications of malaria treatment and household health-seeking behavior in Akwa Ibom State, South-South Nigeria, involving 640 households across three Local Government Areas. The study revealed that 55.7% of households preferred drug stores for malaria treatment, with a total cost per malaria episode averaging 9,305.51 Naira (22.55 USD). Oluwatimilehin, Akerele, Oladeji, Omogbehin & Atai (2022) examined the impact of climate change on diseases in Lokoja City, Nigeria, finding significant relationships between climatic parameters and diseases. Opaluwa, Opeyemi, David & Ochimana (2022) investigated the impact of malaria on maize productivity in Idah Local Government Area, Kogi State, Nigeria, finding that malaria significantly affected maize productivity.

Ademu, Agada, Adejoh, & Halilu (2021) explored socio-economic factors influencing women's entrepreneurial activities in Kogi State, emphasizing the importance of motivators such as age, education, and income. Gooch, Martinez-Vazquez & Yedgenov (2021) studied the impact of malaria endemicity in 1900 on institutional development, finding a significant link between endemicity and regulatory quality. Babalola, Omeonu, Osuntade, Julius & Kalu (2021) investigated the link between infant mortality rate and government expenditure on malaria, revealing that both infrastructure development index and government expenditure on malaria significantly decreased infant mortality rate. Carrasco-Escobar, Fornace & Benmarhnia (2021) assessed socioeconomic inequalities in malaria prevalence in Sub-Saharan Africa, revealing significant disparities within and between countries. Sarpong & Bein (2021) examined the impact of global fund and good governance on malaria incidence and quality of life in sub-Saharan Africa, finding varied correlations based on oil-producing and non-oil producing countries.

While existing studies touch on socioeconomic factors, climate change, and productivity, there is a need for a more comprehensive analysis of the combined influence of education, occupation, and income levels on malaria prevalence in Kogi State. Additionally, utilizing a binary logistic regression technique could provide a more targeted analysis. Current studies in Kogi State focus on specific Local Government Areas, neglecting areas prone to flooding. Therefore, a study investigating seven flood-prone LGAs and their relationship with socioeconomic factors could significantly contribute to understanding malaria dynamics in the region, informing targeted interventions and policies for improved public health outcomes.

## 3. METHODOLOGY

### 3.1 Theoretical Framework

The study is based on Human Capital Theory, posited by Becker (1964), which likens human capital to the "physical means of production" and suggests that an individual's level of human capital is directly linked to economic development and the ability to mitigate health risks (Becker, 1964). The model asserts that higher educational attainment and socioeconomic status correlate with lower malaria incidence due to increased access to resources like clean water, mosquito nets, and better medical care (Koenker, Keating, Alilio, Acosta, Lynch, Nafo-Traore, 2014). The theory is expressed as:

$$H = f(HC, SES) \quad \ldots\ldots [1]$$

Where *H* is health outcomes, *HC* is human capital, and *SES* is socioeconomic status. Human capital encompasses knowledge, skills, and abilities influencing health, while SES reflects one's societal position based on economic and social factors. The function *f* represents the complex relationship between human capital, socioeconomic status, and health outcomes, influenced by various factors such as living conditions, healthcare access, stress, and lifestyle choices.

### 3.2 Research Design

The research design employed for this study is a descriptive survey research design, focusing on a quantitative approach. The objective is to investigate the relationship between socioeconomic status and the prevalence of malaria in designated urban and rural areas of Kogi State. The study utilized a randomly selected population for data collection and analysis.

### 3.3 Study Area

The study is conducted in Kogi State. Kogi State, located in the North Central Geo-Political Zone of Nigeria, was established on August 27, 1991, with Lokoja as its capital. The state comprises three senatorial districts (Western, Eastern, and Central) and has 21 LGAs, spanning latitudes 6°30 'N to 8°48 'N and longitudes 5°23 'E to 7°48'E, covering a total land area of 29,833Km$^2$. It shares borders with 10 other Nigerian states and is known for its major ethnic group, the Igala, residing in the East of the Niger. The economy is primarily agriculture-based, contributing around 80 percent to employment (Onuche, Opaluwa & Edoka, 2014).

### 3.4 Type and Sources of Data

Data collected for this study was primary data, and they were collected from respondents across seven local government areas of Kogi state. Primary data were obtained by way of a structured questionnaire to gather information from the respondents on demographic characteristics, socio-economic status of respondents, knowledge about factors related to the prevalence of malaria, and the influence of malaria prevalence on the productivity of workers.

### 3.5 Population of the Study

The population for this study consists of individuals drawn from 21 villages selected from seven LGAs. The LGAs covered in the study include Lokoja, Ajaokuta, Omala, Igalamela-Odolu, Kabba/Bunu, Ibaji and Bassa. The population of these LGAs based on the National Population Commission Census of 2006 were 196,643; 122,432; 107,968; 147,048; 144,579; 127,572 and 139,687 respectively (NPC, 2006). The seven LGAs were selected because the life cycle of mosquito's vector is supported by the climate of the areas and the continuity of malaria transmission is aided by the rainfall of Kogi State. Besides, the seven LGAs purposively selected for investigation had rivers around them and are prone to flooding. The total population of the selected LGAs in 2020 based on the 2.08 percent population growth rate of the state is 985,929.

### 3.6 Sample Size of the Study

The sample size was calculated by using Yamane (1967) formula given as:

$$n = \frac{N}{1+ Ne^2}$$

Where: *n* represents sample size; *N* represents Population size; and *e* represents the error of 5 percent. Using this formula, the population size for this study is:

$$n = \frac{985{,}929}{1 + 985{,}929(0.05)^2}$$

$$= \frac{985{,}929}{1+ 985{,}929\ (0.0025)} \quad = \frac{985{,}929}{1+2{,}464.8225} \quad = \frac{985{,}929}{2{,}465.8225} \quad = 399.8377823221257$$

n = 400.

### 3.7 Sampling Techniques

The sample size of the selected 7 LGAs in Kogi State was estimated using Bowley's proportional allocation statistical techniques. The formula is given as follows: $nh = \frac{nNh}{N}$. Where: $nh$ is the number of unit allocated to each category of undergraduate students and academic staff; $Nh$ is the number of undergraduate student and academic staff in each category; $n$ is the total sample size; and $N$ is the actual or total population.

**Proportional Allocation for the Selected 7 LGAs in Kogi State:**

Lokoja Proportion of respondents to be sampled: $nh = \frac{400 \times 196{,}643}{985{,}929} = 80$; Ajaokuta proportion of respondents to be sampled: $nh = \frac{400 \times 122{,}432}{985{,}929} = 50$; Omala proportion of respondents to be sampled: $nh = \frac{400 \times 107{,}968}{985{,}929} = 43$; Igalamela-Odolu proportion of respondents to be sampled: $nh = \frac{400 \times 147{,}048}{985{,}929} = 60$; Kabba/Bunu proportion of respondents to be sampled: $nh = \frac{400 \times 144{,}579}{985{,}929} = 58$; Ibaji proportion of respondents to be sampled: $nh = \frac{400 \times 127{,}572}{985{,}929} = 52$; Bassa proportion of respondents to be sampled: $nh = \frac{400 \times 139{,}687}{985{,}929} = 57$.

Therefore: 80 + 50 + 43 + 60 + 58 + 52 + 57 = 400.

### 3.8 Methods of Data Analysis

The Binary Logistic regression method was used to determine the relationships between socioeconomic status and prevalence of malaria in selected urban and rural areas of Kogi State Binary logistic regression is a suitable statistical method when the dependent variable is binary or dichotomous, meaning it has only two possible outcomes. In this case, the study aims to examine the relationship between socioeconomic status and the prevalence of malaria in selected urban and rural areas of Kogi State. The outcome variable, which is likely to be the presence or absence of malaria, is binary, making binary logistic regression an appropriate choice. The descriptive statistics such as percentages, frequencies, cross tabulation and graphs was used to show the socio-demographic and socioeconomic characteristics of residents in the selected urban and rural areas of Kogi State. The SPSS version 28 was employed for coding and analysis of data.

### 3.9 Model Specification

The revised model from Equation [1] considers malaria prevalence as the dependent variable, with independent variables encompassing various occupations, income levels, and education tiers. Binary Logistic Regression is employed to achieve the study's objectives.

Binary Logistic Regression is a statistical method used for analyzing the relationship between a binary dependent variable and one or more independent variables (Harrell, 2001). It is primarily used when the dependent variable is categorical and has only two possible outcomes, such as "yes" or "no", "1" or "0", "success" or "failure", etc.
The model is expressed as in Equation [2]:

$$P(Y = 1) = \frac{1}{1+e^{(b_0 + b_1X_1 + b_2X_2 + \cdots + b_nX_n)}} \quad \text{.....[2]}$$

Where: *P(Y = 1)* is the probability that the dependent variable Y equals 1; *e* is the base of the natural logarithm; $b_0$ is the intercept; $b_1$, $b_2$, ..., $b_n$ are the coefficients for the independent variables $X_1$, $X_2$,..., $X_n$.

Therefore, to achieve the objectives of the study which are to examine the impact of the level of education, type of occupation, and level of income on prevalence of malaria in selected urban and rural areas of Kogi State, the binary logistic regression form of the model is presented in Equation [3] as;

$$P(MAL = 1) = \frac{1}{1+e^{(\beta_0 + \beta_1 LOD + \beta_2 TOC + \beta_3 LON + e)}} \quad \text{.....[3]}$$

Where: $P(MAL = 1)$ is probability that Prevalence of Malaria equals 1; LOD is Level of Education; *TOC* is Type of Occupation; *LON* is Level of Income; $\beta_0$, $\beta_1$, $\beta_2$, $\beta_3$, are the coefficients for the independent variables; and *e* is error term.

### 3.10 Reliability of Instrument

Cronbach's alpha was utilized for reliability analysis, with a widely accepted threshold of 0.70 according to Nunnally (1978).

## 4. RESULTS AND DISCUSSION OF FINDINGS

From the course of the field survey, four hundred (400) questionnaires based on the sample size were distributed to respondents of households in 7 LGAs in Kogi State, out of which only three hundred and ninety-seven (397) questionnaires were filled and returned representing 81% references.

**Table 5: Socio-Demographic Information of Respondents**

| Question | Response | Frequency | Percentage |
|---|---|---|---|
| How old are you? | 18-30 years | 179 | 45.1 |
| | 31-50 years | 167 | 42.1 |
| | 51-70 years | 43 | 10.8 |
| | 71years and above | 8 | 2.0 |
| | **Total** | **397** | **100** |
| What is your marital status? | Single | 188 | 47.4 |
| | Married | 197 | 49.6 |
| | Divorced | 12 | 3.0 |
| | **Total** | **397** | **100** |
| What is your gender? | Male | 257 | 64.7 |
| | Female | 140 | 35.3 |
| | **Total** | **397** | **100** |

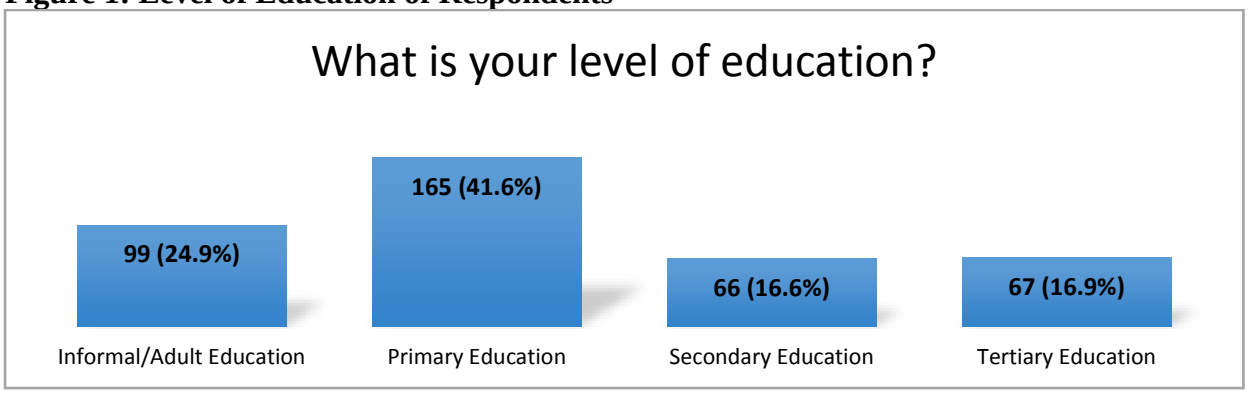
**Source:** SPSS Output, 2023.

Table 5 summarizes respondent demographics, indicating that 45.1% were aged 18–30, 42.1% were aged 31–50, 10.8% were aged 51–70, and 2% were 71 or older. Thus, the majority fell within the 18–30 age bracket. In terms of marital status, 47.4% were single, 49.6% were married, and 3% were divorced, suggesting that the majority were married. Additionally,

64.7% were male, and 35.3% were female, indicating a majority of male respondents across the 7 LGAs of Kogi State.

**Socioeconomic Status Information**

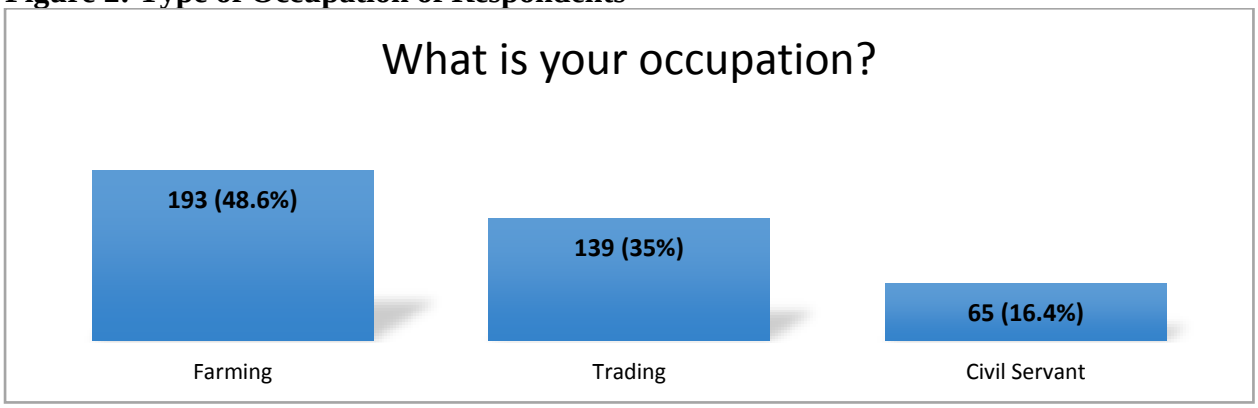
**Figure 1: Level of Education of Respondents**




**Source:** SPSS Output, 2023.

Figure 1 shows that among all respondents, 24.9% have informal/adult education, 41.6% have primary education, 16.6% have secondary education, and 16.9% have tertiary education as their highest educational attainment. This suggests that the predominant highest level of education among respondents in selected urban and rural areas of Kogi State is primary education.

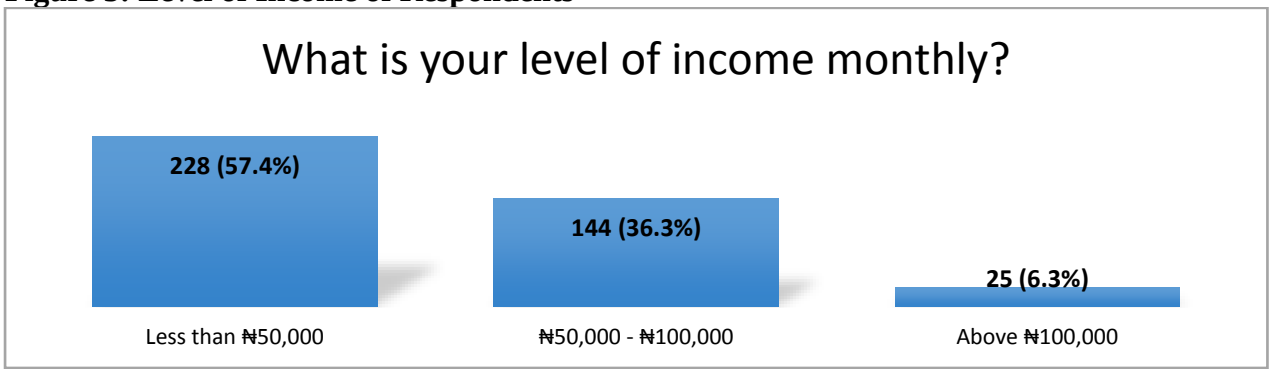
**Figure 2: Type of Occupation of Respondents**




**Source:** SPSS Output, 2023.

In Figure 2, the data reveals that 48.6% (193 individuals) of respondents in the chosen urban and rural areas of Kogi State work as farmers. Trading is the occupation for 35% (139 individuals), while 16.4% (65 individuals) are employed as civil servants.

**Figure 3: Level of Income of Respondents**




**Source:** SPSS Output, 2023.

In Figure 3, 57.4% of respondents (228 individuals) have a monthly income below ₦50,000. Another 36.3% (144 respondents) fall in the ₦50,000 to ₦100,000 range, while 6.3% (25 respondents) earn over ₦100,000 monthly. This highlights that the majority earn less than ₦50,000 monthly.

**Binary Logistic Regression**

**Table 7: Binary Logistic Regression Result of the Impact of Socioeconomic Status on Prevalence of Malaria**

| Dependent Variable | Independent Variables | Coefficient | Standard Error | Significance |
|---|---|---|---|---|
| MAL | LOD | -0.276 | 0.113 | 0.014** |
| | TOC | 0.309 | 0.143 | 0.031** |
| | LON | 0.622 | 0.183 | 0.001** |
| | Constant | -1.344 | .379 | 0.000** |
| **Cox of Snell $R^2$** | **0.470** | | | |
| **Nagel Kerke $R^2$** | **0.630** | | | |

** indicates significance level of p<0.05

**Source:** Author's Computation using SPSS version 28.

Table 7 results show that education level (LOD) has a coefficient of approximately -0.276, indicating a 0.276-unit decrease in the log-odds of malaria prevalence (MAL) for a one-unit increase in LOD. Occupation type (TOC) has a coefficient of about 0.309, signifying a 0.309-unit increase in the log-odds of MAL with a one-unit TOC increase. The income level (LON) coefficient is roughly 0.622, suggesting a 0.622-unit rise in the log-odds of MAL for a one-unit LON increase. Additionally, p-values for LOD, TOC, and LON are 0.014, 0.031, and 0.001, respectively, all below 0.05. This implies rejection of null hypotheses and acceptance of alternative hypotheses, indicating statistical significance for education level, occupation type, and income level. Specifically, higher education (LOD) negatively impacts malaria prevalence, while occupation type (TOC) and income level (LON) have positive significant effects. Finally, Nagel Kerke R2, a robust measure of goodness of fit, is 0.630, suggesting that the model explains a substantial portion of the variance in the dependent variable across urban and rural areas in Kogi State.

**Table 8: Reliability Test Result**

| | |
|---|---|
| **Valid Number of Respondent** | 397 |
| **Excluded Number of Respondent** | 0 |
| **Number of Items** | 11 |
| **Cronbach's Alpha** | 0.935 |

**Source:** Author's Computation using SPSS version 28.

The Cronbach's Alpha result of 0.935, with no excluded respondents, indicates high reliability for the survey. The 11 items measuring variables demonstrate strong internal consistency. This implies that the survey is a valid and dependable tool for assessing the impact of socioeconomic status on malaria prevalence in selected urban and rural areas of Kogi State.

### 4.2 Discussion of Results

The negative coefficient for the level of education (LOD) indicates that as the level of education increases, the log-odds of the prevalence of malaria decrease. Additionally, considering the socioeconomic distribution of respondents, as depicted in Figure 1, which shows that a majority of respondents have primary education as their highest level of education, it implies that

individuals with higher education, such as tertiary education, are more likely to have a better understanding of malaria prevention measures and are more inclined to adopt these measures, thus reducing the prevalence of malaria in Kogi State.

The positive coefficient for the type of occupation (TOC) indicates that as the type of occupation changes, the log-odds of the prevalence of malaria increase. Moreover, considering the socioeconomic distribution of respondents, as shown in Figure 2, which reveals that the majority of respondents work as farmers, this suggests that the nature of farming activities, the primary occupation in Kogi State, may be linked to higher malaria risk factors, possibly due to exposure to mosquito breeding sites or inadequate housing conditions.

The positive coefficient for the level of income (LON) indicates that as the level of income increases, the log-odds of the prevalence of malaria also increase. Additionally, looking at the socioeconomic distribution of respondents in Figure 3, where the majority earn less than ₦50,000 per month, it becomes evident that lower-income individuals are more vulnerable to malaria infection due to their limited access to healthcare and resources for malaria prevention.

In summary, the findings suggest that education, occupation, and income levels all play significant roles in shaping the prevalence of malaria in Kogi State. This goes in conformity with the empirical works of Anjorin et al (2023) that community based malaria prevalence, household head are all socioeconomic factors that determine malaria prevention options adopted by households in 11 Sub-Saharan African countries; and Affiah et al (2022) which revealed that while incidence of malaria and direct cost of malaria have negative impact on food security, level of education had negative impact on food security in Kogi State.

## 5. CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

The results of this study demonstrate that education, occupation, and income levels play significant roles in shaping the prevalence of malaria in Kogi State. While higher levels of education and certain occupations appear to contribute to reduced malaria prevalence, increased income levels appear to have the opposite effect. These findings have important implications for public health initiatives and interventions in the region. Therefore, this paper underscores the need for a holistic and multifaceted approach to combat malaria in Kogi State. By addressing the socioeconomic determinants of this disease, work can be done towards reducing its prevalence and improving the overall health and well-being of the population.

### 5.2 Policy Recommendations

Based on the findings of the study, the following policy recommendations were proffered:

Given that the negative coefficient for the level of education suggests that as education levels increase, the prevalence of malaria decreases, it is recommended that policies be put in place to encourage and support higher levels of education in Kogi State. This could include scholarship programs, adult education initiatives, and awareness campaigns to emphasize the importance of education in preventing malaria. To further reduce malaria prevalence, it is important to conduct targeted awareness campaigns that educate individuals, especially those with primary education as their highest level, about preventive measures against malaria. These campaigns should focus on improving knowledge and encouraging the adoption of preventive measures.

Since the positive coefficient for the type of occupation suggests that changing the type of occupation may increase the prevalence of malaria, it is recommended to implement

occupational health and safety measures, particularly for those engaged in farming activities. This includes measures to reduce exposure to mosquito breeding sites and improving housing conditions for individuals involved in farming. Implementing agricultural practices that minimize the risk of malaria transmission should be a priority. This can include promoting mosquito control methods in agricultural settings and ensuring proper drainage and sanitation in farming areas.

To address the positive coefficient for the level of income, which indicates that higher income levels are associated with increased malaria prevalence, policies should focus on improving healthcare access for lower-income individuals. This can be achieved by expanding affordable healthcare services, subsidizing treatment and preventive measures, and providing financial support to vulnerable populations. Encouraging income diversification among the population, particularly for those with lower incomes, can reduce the risk of malaria. This may involve promoting alternative sources of income, vocational training, and economic empowerment programs to improve livelihoods and access to healthcare.

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