THE ECONOMIC COSTS OF MALARIA AND BEHAVIOUR OF FARMING HOUSEHOLDS TOWARDS TREATMENT CARE IN IBESIKPO ASUTAN LOCAL GOVERNMENT AREA, AKWA IBOM STATE, NIGERIA

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ABSTRACT

Malaria is an endemic disease and remains a significant public health issue with farmers particularly vulnerable to mosquito bites owing to the nature of their work. This study aimed to estimate the direct and indirect costs associated with malaria episodes at the household level and also determine the factors that influence the choice of treatment sources by malaria-stricken households. The study was conducted at Ibesikpo Asutan Local Government Area, Akwa Ibom state and the population of this study included all farm households in the study area. Purposive and random walk sampling techniques were adopted to select a total sample of 200 households for this study and a structured questionnaire was used to collect cross-sectional data from farming households. The Cost of Illness Model was used to estimate the economic cost of malaria, by combining the direct medical cost, direct non-medical cost, and labour productivity loss. The total economic burden imposed by malaria was estimated to be ₦12,530.1 per episode per household. The study reveals low patronage of conventional treatment sources (modern health services) among the farming households and high levels of self-medication and traditional means as treatment options. The study also shows that the farming household's socioeconomic characteristics affect their choice of treatment care services. Specifically, sex, age, education and household income, are important determinants for traditional means, while household size, marital status and number of episodes are important for self-medication. Policy indications emerging from the study suggest public health enlightenment programmes to both farming households and health practitioners, and extensive control of the drug market by National Agency for Food and Drug Administration and Control (NAFDAC).

Keyword: Malaria, Economic Cost, Direct Costs, Indirect Costs

INTRODUCTION

Malaria is an endemic disease and remains a significant public health issue, especially in the sub-Saharan African countries (Miura, 2013; WHO, 2022). According to WHO African Region report, of the 234 million global cases in 2021, Africa accounted for about 95% of malaria incidence, making the continent the leading region in terms of malaria burden. Nigeria is among the countries with the highest malaria burden in the world, accounting for about 27% of malaria cases worldwide and 31% of all malaria deaths globally with about 97% of the population at risk of malaria infection (Federal Ministry of Health, Nigeria, 2011, WHO, 2022). Some studies have shown that about 50% of the adult population in Nigeria suffer at least one episode in a year while children below five years suffer between two and four episodes in a given year (Adedotun, Morenikeji and Odaibo 2010).

Incidence and frequency of malaria episodes, coupled with its high morbidity and mortality has put substantial financial burden and a heavy economic cost on households, the healthcare system, and national economy (Gallup et al, 2001; Russell, 2004; Okorosobo et al, 2011). At the household level, the economic costs often fall into two categories: First, direct costs that include medical (treatment and control) and non-medical (transport, lodging, and food) expenses (Andrade et al., 2022); Second, indirect costs that include absenteeism (short-term absence from work or school due to health problems), presenteeism (reduced performance while working or at school due to health problems), and the value of lost time due to morbidity or premature mortality (Andrade et al., 2022).

A major malaria disease burden is the loss of productive hours. It is known that diseases like malaria, which undermine human health and

wellbeing often reduce productivity of those affected directly and indirectly (Mustafa and Babiker, 2007; Kumar and Kober, 2012; Rogerson et al., 2018; Onwujekwe et al., 2013, Mabe and Dafurika Malar J, 2020), causing people to feel weak and unable to work. This results in a loss of the household head or caregiver productivity and loss of farm labour. (Segel, 2006; Changik, 2014; WHO, 2015). It is therefore vital to seek prompt care from available treatment options so that household output is not jeopardized as human labour is critical in the survival and sustainability of the small-scale farm production system in developing countries. (Akpan, Nkanta and Udoh, 2023).

On the basis of theories of utility and choice preferences, rational individuals choose and demand different health care treatment sources based on the influence of certain observable and unobservable factors (Udoh, et. al., 2008). Primary among them is the price element of accessing the health option. The price factor defines the cost associated with each of the treatment option and the rate of responsiveness to seek immediate treatment, thus the treatment seeking behaviour of individual households refers to the actions that individuals and households take to bring about a better health condition earlier worsened by illness (Waliyanti et al. 2018). Early diagnosis and effective treatment of all malaria cases is critical to reducing the malaria burden and maintaining good health. The WHO recommends that treatment for malaria should occur within 24 hours of the onset of malaria symptoms to prevent the advancement of infection (WHO, 2015; Bhatt et al., 2015; Challenger et al., 2019). A recent systematic review on the impact of delaying in seeking malaria treatment indicates that the risk of severe malaria for patients seeking care more than 24 hours was higher than those seeking care less than 24 hours (odds ratio: 1.33, 95% CI: 1.07–1.64) (Mousa et al., 2020).

Household members in the rural areas, where the majority of farmers reside, usually have no health insurance. Therefore, financing of health care necessitates the movement of funds from a household's budget to pay for treatment provided by chosen healthcare providers. This lack of efficient and affordable health care for all community members and lack of financial protection significantly affect treatment behaviour and choice of provider especially malaria that has a high rate of recurrence in the rural areas (Udoh, et al, 2008).

The need for the choice of proper and effective malaria treatment cannot be overstated. For instance, adequate treatment for children through the selection of a proper treatment provider has a lasting effect in their adult life and even throughout their lifetime as it affects their productivity (Bleakley 2007; Miguel and Kremer 2004). It has also been discovered that poor choice of treatment providers has detrimental impacts on the working-age population in many developing countries (Field, Robles, and Torero 2009). Even among developed countries, there is evidence that improvements in health outcomes result in improved economic wellbeing and productivity (Bloom, Kuhn, and Prettner 2018). This improvement in health most times depends on the choice of healthcare provider (Bojola et al. 2018). Poor choice of healthcare provider can lead to the experience of recurring episodes which affects productivity (Ellis et al. 2012). Maintaining good health thereby entails appropriate treatment-seeking behaviour guided by a good treatment provider selection (Olenja 2003; Ihaji, Eze, and Ogwuche 2014).

Expenditures made for treating malaria cases are majorly out-of-pocket expenditures which are very high and deleterious compared to all other illnesses put together (Onwujekwe et al., 2010; Ezeoke, Onwujekwe, and Uzochukwu, 2012). Some studies discovered that common health responses to payment difficulties include increased borrowing, distress sales of productive assets, delays to treatment and eventually abandonment of treatment. According to Snowden (2016), health expenditures on malaria drain limited resources of households. Snowden also estimated that when malaria prevalence is reduced, long term productivity would be improved substantially.

Premised upon the foregoing discussions, this study was framed to generally investigate the economic cost of malaria and malaria treatment-seeking behaviour of farming households in Ibesikpo Asutan, Akwa Ibom State. The specific objectives were to:

1. Identify the socio-economic characteristics of the farming households.
2. Estimate the direct and indirect costs associated with malaria episodes at the household level.
3. Determine the frequency of patronage given to treatment sources by malaria-stricken households.
4. Estimate the determinants of choice of treatment sources for malaria attack.

Methodology

Area of Study

The study area was Ibesikpo Asutan Local Government Area of Akwa Ibom State, Nigeria. Ibesikpo-Asutan is one of the thirty-one Local Government Areas in the State, made up of 43 villages, divided into two clans namely Ibesikpo and Asutan Clans. The area occupies a total land mass of about 175.5 km^2 with Nung Udoe as its headquarters. According to the most recent census, Ibesikpo Asutan has a population of 137,127 with 69, 681 males and 67, 446 females (National population census NPC, 2006). Ibesikpo Asutan is bounded on the North by Uyo LGA, South by Nsit Ubium LGA, East by Uruan and Nsit Atai LGAs and West by Nsit Ibom LGA.. Climate is tropical and marked by dry and wet seasons. It has a mean annual rainfall of 2,200mm with a daily mean temperature of 20 to 31 degrees Celcius which favours a wide range of agricultural production.

The rural communities in this area are predominantly agrarian, relying on household labour for cultivation of a variety of crops and raising of livestock. The study area is also characterized by availability and proximity of health care facilities such as hospitals, health centres, pharmacies, chemists, etc which was relevant for this study. The choice of the study area is therefore informed by this fact.

Data Types and Sampling Procedures

Two-stage sampling procedures were adopted for sample selection. The first stage involved purposive sampling of 12 villages (out of the 43 villages) that are largely agrarian and have access to nearby modern health care services. This accounted for 23.3% of the total number of villages.

The second stage adopted a modified random sampling method, known as random walk method to select households from each of the villages. Altogether, 200 households were sampled for the study.

The structured questionnaire was administered to respondents and the information gotten was complemented by personal interviews to ensure consistency and accuracy of the data. Respondents consisted of the household heads or their spouses. However, in their absence, information was collected from an adult household member.

Method of Data Analysis

The data collected were analyzed using descriptive statistics, cost of illness equation and Multivariate logit regression model.

Model Specification

Cost of Illness Model

The cost of illness approach attempts to estimate the burden of malaria in an accounting sense using direct cost of malaria, indirect cost of malaria, and intangible (institutional) cost of malaria care. However, application of the cost-of-illness approach entails inclusion of only direct and indirect cost components, given the difficulties associated with attaching monetary values to the other costs.

The Cost of Illness model can be specified as:

MC = Medical Cost, which includes personal expenditures on consultation and diagnosis, treatment and care of the disease.

NMC = Non-Medical Cost which includes transportation costs for a patient and his/her relatives, and other costs resulting from the illness

LL = Labour Productivity Loss associated with illness, expressed as the cost of lost work days. That is, potential losses of work income incurred due to illness.

As earlier defined, both medical and non-medical costs are the direct cost of malaria treatment which are borne by households, while the labour productivity loss constitutes the indirect cost associated with the illness. Therefore, the COI can be expressed as the function of direct and indirect cost of malaria.

Multivariate Logit Model

Consider the following choice alternatives: 1 = self medication, 2 = modern health services, and 3 = traditional means

Let L_1, L_2 and L_3 be latent variables for these alternatives respectively.

Following the probability distribution, $L_1 = 1$ if the household resorts to self medication during malaria attack and 0 if otherwise; $L_2 = 1$ if the household resorts to modern services and 0 if otherwise and; $L_3 = 1$ if the treatment source is the traditional services and 0 if otherwise.

Hence, probabilities of choosing these alternatives are as follows:

Probability of using self medication

The probability of choosing any of the alternatives is defined as the probability that the utility procured by this alternative is the highest. For instance, the probability of choosing C2 rather than C1 is such that

$$C_2 = P(U_2 > U_1) = P(U_2 + \varepsilon_2 - (U_1 + \varepsilon_1) > 0) = P(U_2 - U_1) < \varepsilon_1 - \varepsilon_2 \ldots\ldots\ldots [5]$$

Assuming that the random terms ε1 and ε2 are independently and identically distributed, we proceed to using a multinomial logit model to dichotomize the choice in relation to determining

factors.
The explicit model is given as:
where;
U_j could be any of the probabilities of choice;
X_i are the demographic and socio economic factors;
X_1 = Sex of the household head, 1 for male and 0 otherwise
X_2 = Age of the household head (in Years)
X_3 = Years in Formal Education of the household head (in Years)
X_4 = Income of the household (in Naira)
X_5 = Household size (Number)
X_6 = Marital status of the household head
X_7 = Number of malaria episodes
S_i is the type of service consulted:
S_1 = modern services,
S_2 = traditional means,
S_3 = self medication
Y is the income of the household and;
P_j is the consultation/treatment fees of the treatment source.
Equation (6) would be estimated via maximum likelihood presented as
$\ln U_j$ where;
i = individual;
j = type of service sought; j = 1 for self medication, j = 2 for modern services, j = 3 for traditional means and j = 4 for divine intervention.
D_{ij} = 1 if alternative j is chosen and 0 if otherwise;
C_{ij} = probability that individual 1 will choose alternative j in treating malaria.

Results and Discussions

Exploratory Statistics

The socioeconomic characteristics of the respondents examined include sex, age, educational level, occupation, marital status, household size, and income. Table 1 presents the frequencies of occurrence.

Table 1:

Variables	Frequency	Percentages
Sex		
Male	82	41.0
Female	112	59.0
Age		
25-29	15	7.5
30-34	8	4.0
35-39	9	4.5
40-44	25	12.5
45-49	79	39.5
50-54	50	25.0
55-59	8	4.0
60 and above	6	3.0
Educational attainment		
1-6	128	64.0
7-12	62	31.0
13 and above	10	5.0
Occupation		
Farming	65	32.5
Trading	93	46.5
Business	14	70
Civil servant	28	14.0
Marital status		
Single	4	2.0
Married	192	96.0
Divorced/widowed	4	2.0
Household size		
1-3	70	35
4-6	110	55
7 and above	20	10
Income level		
30000-49999	12	6.0
50000-69999	100	50.0
70000-89999	82	41.0
90000 and above	6	3.0

Socio-economic characteristics of the respondents revealed that 41.0% of the respondents were male and the remaining 59.0% were female. The highest occurring age class is 45-49 years old accounting for 40.0% of the total respondents and the mean age of the respondents was 46 years old. Most of the respondents (96.0%) were married but single, divorced and widowed respondents still abound amongst them, occupying 2.0%, 1.50% and 0.5% respectively. Educational information of the respondents showed that the highest occurring level of education was primary education with 64% of the respondents followed by secondary education with 31%. Respondents who attend tertiary education Accounted for only 5% of the respondents. Respondents involved in trading activities had the highest frequency accounting for 46.5% closely followed by farming activities with 32.5%. Fourteen percent 14% of the respondents were civil servants and 7% engaged in various kinds of business including sewing, carpentry work etc. Average household size of respondents was approximately 4 persons. The majority of respondents, a significant 50%, fall within the income range of 50,000 to 69,999 Naira and in contrast, 3% of respondents report earning 90,000 Naira or more, which is the highest income category in the table. The mean income of respondents was 64050 Naira.

Cost of Illness Model

Table 2 shows the elements of Direct Medical cost, Non-Medical Costs and indirect malaria cost (Labour productivity loss) associated with malaria illness at household level.

Table 2: Distribution of elements of direct medical, non-medical costs and indirect malaria cost (Labour productivity loss)

associated with malaria illness at household level

Item	Average Amount spent	Mean Score	Multiplier index (Mean score/5)	Adjusted Amount	Average Number of Malaria Episodes in a month	Average Household size	Estimated Monthly cost per household
Drugs	2300	3.25	0.650	1495	0.63	4	3767.40
Herbs	300	1.66	0.332	99.6	0.63	4	250.99
Laboratory test	1500	1.76	0.352	528	0.63	4	1330.56
Consultation fee	1000	1.08	0.216	216	0.63	4	544.32
Registration fee	2500	1.09	0.218	545	0.63	4	1373.40
Total medical cost							**7266.67**
Transportation cost	300	1.44	0.288	86.4	0.63	4	217.72
Food	700	1.22	0.244	170.8	0.63	4	430.41
Telephone	500	1.37	0.274	137	0.63	4	345.24
Total nonmedical cost							**993.38**
Total direct cost per household							**8260.10**
Total direct cost per capita per household							**2065.03**
Indirect malaria cost (labour productivity loss)							**4270**
Indirect malaria cost per capita per household							**1067.50**
Total cost of illness per household per month							**12,530.1**

Medical cost includes expenses such as drugs, herbs, laboratory tests, consultation fees, and registration fees. The total medical cost per household per month is ₦7266.672. Non-Medical expenses cover transportation, food, and telephone expenditures, resulting in ₦993.384 per household per month. Total Direct Cost includes the sum of medical and non-medical costs is ₦8260.1 per household per month. This translates into ₦2,065.03 per capita per household.

Labour productivity loss (LL) was calculated by multiplying the average daily income of respondents by the average inactive days. That is, LL = Average daily income * Average inactive days per episode. In this case, given the average daily income of ₦2135.00 and average inactive days of 2, it amounts to ₦4270 per household per month, and this also translate into 1067.50 per capita per household.

The Cost of Illness combines the direct medical cost, direct non-medical cost, and labour productivity loss. As presented in the table, the total cost is ₦12,530.1 per household per month. This provides the economic burden of malaria on households.

Determinants of Choice of Treatment Sources for Malaria

To analyze the determinants of choice of treatment sources for malaria attack, the treatment choices were grouped into three major categories: Modern services, including hospital, health center and private clinic; Self Medication which included pharmacy and chemist and the unconventional means which included the traditional means and faith based intervention.

The most preferred treatment source was used for analysis. This was obtained by calculating the means of the frequency of usage of the various malaria treatment sources, and then comparing these means to determine which treatment source a respondent preferred the most. On careful analysis of the most preferred treatment source, it was observed that 50 respondents (25%) used self medication as their most preferred treatment source while 150 respondents (75%) used unconventional sources, particularly the traditional means. Hence, the multvariate logistic regression model initially proposed was reduced to a binary logistic regression model and analysis was only carried out on self medication and traditional means as the most preferred malaria treatment sources by the respondents. The results of the analysis are presented in Table 3:

Table 3 Binary Logit Estimates for Determinants of the Probability of Treatment Preference

Variables	Coefficient	Std. error	Slope (dy/dx)	Z-test	Prob.
Constant	2.055311	2.135634	-	0.96	0.336
Sex	1.006326	0.491441	0.1327111	2.048**	0.041
Age	0.049065	0.022139	0.0064705	2.216**	0.037
Years in formal education	0.197037	0.114753	0.0259846	1.717*	0.086
Income	8.45E-05	0.000015	1.91e-06	5.633***	0.000
Household size	-0.235282	0.048943	-0.0310283	-4.807***	0.000
Marital Status	-1.461284	0.879535	-0.1927095	-1.661*	0.097
Number of episodes	-0.722246	0.18057	-0.0952475	-4.000***	0.000

*,**,*** denote significant at 10 percent, 5 percent and 1 percent respectively
Based category/outcome: Self Medication
LR chi2(7) = 48.07; Prob> chi2 = 0.0000; Pseudo R2 = 0.2158;
Log likelihood = -87.320592

In the estimation, using self medication as a treatment source was taken as the base category. The positive significant coefficient on age suggests an increase in patronage of traditional means among older persons as against self medication. This suggests a strong belief system among the aged. The coefficient for sex is statistically significant for all the options implying that households headed by male prefer traditional means.

Some level of education increases the likelihood of seeking medical attention for malaria treatment from traditional means as indicated by the positive significant coefficients of education. Income is estimated to have a negative significant effect. This implies that high earning households

have a high level of likelihood of using self medication for treatment of malaria as opposed to traditional means. Household size is estimated to have a negative significant effect. This implies that households with a larger number of persons have a high level of likelihood of using self medication for treatment of malaria as opposed to traditional means.

Marital status is estimated to have a negative significant effect. Accordingly, married persons have a high level of likelihood of using self medication for treatment of malaria. Number of malaria episodes is estimated to have a negative significant effect. Accordingly, respondents who have more frequent malaria episodes tend to adopt self medication for treatment of malaria instead of traditional means.

Conclusion and Recommendations

The data indicated distinct patterns in care-seeking behavior for malaria treatment. Hospitals, health centers, and private clinics were underutilized, with a significant percentage of respondents never using them. On the other hand, self-medication was popular source of treatment, particularly for over-the-counter medications. Traditional means, such as herbal remedies, were frequently employed, with 61.5% of respondents consistently relying on them.

Based on the findings of this study, the following recommendations are made:

1. To educate farming households of the importance of obtaining timely and adequate medical treatment for malaria, awareness programs should be launched. The benefit of receiving treatment from appropriate sources as well as any possible repercussions of postponing it or using inappropriate sources should be covered.
2. It is important to work on expanding access to formal healthcare facilities, such as hospitals and health clinics, in order to lessen the financial burden that malaria causes. This can be accomplished by making healthcare services more accessible and inexpensive for the rural community and by building out the healthcare infrastructure.
3. The provision of high-quality malaria treatment alternatives can be ensured through partnerships between public health authorities and commercial pharmacies and chemists. This involves keeping an eye on and controlling the distribution of anti-malarial drugs in private settings in order to guarantee their efficacy.
4. The National Agency for Food and Drug Administration and Control (NAFDAC) should intensify efforts in checking production and distribution of drugs to ensure that only genuine drugs are traded. Conventional medical training should be given to herbal practitioners to enhance their capabilities in drug administration.

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