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Socio-Economic Impact Of Malaria Epidemics On Households In Nigeria: Micro evidence From Kwara State

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Socio-Economic Impact Of Malaria Epidemics On Households In Nigeria: Micro evidence From Kwara State

Abstract

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This study focused on the effects of malaria on household productivity, expenditure and mortality in Kwara state, Nigeria. In recent years, there has been increase in human and financial commitments to Malaria control, nationally and internationally, partly due to the need to meet the Development targets set in the Millennium Development Goals (MDGs) and that of the National Economic Empowerment and Development Strategy (NEEDS). All these efforts have however, not translated into significant decrease in its incidence and impact in Nigeria. This served as a motivation for this study. Living in malaria-endemic regions places an economic burden on households even if they do not actually suffer an episode of malaria. Using binary response model, the study analyzed the effect of malaria on productivity, household expenditure and mortality rate. The result obtained shows that study is that differences in household costs of malaria are the product of complex relationships between social, economic and epidemiological factors. It further showed that malaria infection have negative effects on productivity, treatment cost of all household have a positive effect on private expenditure especially of the marginal groups and malaria infection has a positive effect on mortality rate. This is a serious threat to the achievement of the NEEDS and MDGs target to eradicate the endemic disease. The study recommends a more holistic approach for control of Malaria to include periodic fumigation of the environment among and others.

Introduction

Malaria morbidity and mortality rate are on the rise worldwide, especially in Africa, which accounted for about 90% of malaria deaths (WHO, 2000). Despite several years of research and effort by Government in malaria endemic countries and the unprecedented attention to fight the disease, the prevalence continue to increase in these countries. At the economy wide level some macroeconomists have estimated that the annual growth rate of economy of countries with severe malaria are 1.3% lower, even after controlling other factors known to influence economic growth. Many researches have also shown that malaria places significant burdens on households that have a sick family member. These include lose of time from work by the sick individual, care giving time spent by other family members, lost of productivity, cost of seeking treatment (including transportation and medical care), and premature mortality. Very few of these studies have treated the impact of malaria on the socio-economic variables and incidence on the various occupational groups.

The first goal of the Millennium Development Goal (MDGs) is to half and afterwards begins reverse the incidence of malaria and other major disease by 2015. Less than Four years to the due date, there is no indication that the war against malaria is close to being started. By extension it is also not clear whether the replica of MDGs in Nigeria, National

Economic and Empowerment and Development Strategy (NEEDS) will be able to achieve the target set of, MDGs and the Roll Back Malaria program (RBM). These served as the springboard to further examine the socioeconomic impact of malaria epidemics on households in Kwara state, Nigeria. The choice of kwara state is because, the state lie in a climatic transition region between the savanna and the rain forest.

The main objective of this study therefore is to determine the socio-economic impact of malaria on household expenditure in Kwara state. Other objectives include:

- i. Determine the impact of malaria on mortality in Kwara State.
- ii. Determine the effect of malaria on productivity.

The rest of this study is organized into four sections. Section II undertakes the review of related literature, while section III discussed the methodology. In section IV, the paper presents data analysis and evaluation, while section V draws the conclusion and makes recommendations.

An Overview of Malaria Control Activities and Programmes in Nigeria

Malaria is major public health problem of Nigeria, with stable transmission throughout much of the

country and with the largest population at risk in Africa. The coverage of the key Roll Back Malaria (RBM) interventions remains unacceptably low. Malaria control and finances are decentralized in Nigeria. At the National level, with the collaboration of RBM partners, the emphasis is placed on development of key control policies and guidelines, allocation of resources and resources mobilization, monitoring and supervision. At the state level efforts are centered on interpreting policy, resources mobilization, support and supervision for implementation and also establishing link between local government agencies and NMCP. At the local level, they focus on resources mobilization and implementing community-based activities.

All the three levels of government are involved in monitoring and evaluation. A country strategic plan of action for 2001-2005 was developed that outlines six priority for malaria control and these focused on (i) Case management; (ii) Prevention; (iii) Information, education and mobilization; (iv) Partnerships and overall health system development; (v) Operational research, and (vi) Monitoring and evaluation

At the international level, in September 2000 the United Nations Millennium summit endorsed the Millennium development Goals (MDGs) in what was called the "Millennium Declaration". More than one hundred eighty countries were signatories to this declaration. The main objective of the Millennium summit was to set quantifiable and time bound global development goals to end human suffering from hunger, destitution and disease mainly in developing countries. Since its inception, MDGs have been embedded in several international and regional initiatives and have continued to increasingly influence policy decision throughout the developing world. The MDGs consist of 8 goals, 18 targets and 48 indicators that are agreed upon by 180 member states of the United Nations at the Millennium declaration in 2000. Malaria eradication is an important target in Goal 6.

In Nigeria, in a bid to control malaria, in April 2007, the government, supported by development partners in conjunction with private sectors had distributed over 10 million insecticide treated nets (ITN) to pregnant women and children under five years. In Kwara State, the state government also distributed 700,000 long lasting insecticide treated bed nets (LLITNS) to the group identified as vulnerable to malaria in the councils in the State. Drugs were also procured and distributed to 16,500 pregnant women in the state as intermittent preventive treatment (IPT) during the second and third trimester of pregnancy. 487,000 children under the age of five have enjoyed free

distribution of Artemisia combination therapy. These no doubt has significantly reduced cost on malarial treatment to the household, but the incidence and impact of the remaining cost on the household yet unknown.

Review of Existing Evidences

There has been several evidences of effort to empirically and theoretically measure the socio-economic impact of malaria epidemics in malaria affected regions. A survey by Utzuger et al (2003), showed that investments in malaria control in Zambia during the colonial period reduced worker's absenteeism in cooper production and long time economic development. Living with malaria infection could slow down productivity within the household since the individuals have to be ready to substitute for other family members suffering from malaria. There are evidence that households working in malaria-endemic regions are less likely to grow crops that require labour inputs at critical periods during the growing or harvesting season than households living in areas with low malaria transmission. The cumulative cost of adapting to living in malaria endemic regions that are borne by all households are at least as important as the cumulative costs incurred by those who actually suffer from the disease.

Evidences from Empirical Literature

Many approaches have been employed to measure the economic burden of malaria in Nigeria but the most recent is the Willingness to Pay Approach [WIPA] by Jimoh, A. et al (2007). The study indicates that malaria imposes great burden on the society as its adverse effect is on the mental, physical and social well being of people as well as on the economic development of a nation. The result showed that households are willing to pay a minimum of an average of about ₦ 1,112 per month. With a nation of the 140million people this can translate to about billions of naira per annum, with its associated impact on economic growth.

Using Classification Rule Analysis [CRA], McCarthy (2000), examined the determinants of cross-country differences in malaria morbidity and examined the linkage between malaria and economic growth, it was confirmed that there is a dominant role of climate in accounting for cross-country difference in malaria morbidity. Controlling for climate, suggests that access to rural health care and income equality influence malaria morbidity, in addition the study further showed that there is a significant negative association between higher malaria morbidity and the growth rate of GDP per capita. The study estimated that absolute growth impact of malaria differs sharply across countries; it exceeds a quarter percent per annum in a quarter of the sample

countries. Most of these are located in sub-Saharan African [with an estimated annual growth reduction of 0.55%].

Although a vicious cycle between malaria and poverty is acknowledged, there is no detailed evidence on how malaria and poverty relate at the household level. Studies focus on estimating direct costs of treatment and prevention (including transport to treatment source and special foods), and the indirect costs of time lost by the sick individual and the caretaker and premature mortality. Direct costs of malaria range from \$0.41 in Malawi to \$7.38 in Ghana. A few studies have estimated the cost of treatment as a proportion of household income to range between 2.0 % and 2.9 %. These figures are well below the 10% or more of total income often taken to be indicative of costs for households. Only two of the studies reviewed compare how cost burdens vary by socio-economic status. These studies suggest that costs of malaria are highly regressive; i.e. the poor spend a significantly higher proportion of their income on malaria than their least poor counterparts'. In Malawi for example, total cost burdens averaged 7.2% of monthly household income but the poor incurred an average cost burden of 32% malaria.

Onwujekwe et al (2000) compared the financial and economic costs of malaria attack to that of a combination of other illness episodes on households in five malaria holo-endemic rural communities. The findings showed that the cost of treating malaria illness accounted for 49.87% of curative health care costs incurred by the households. Average malaria expenditure was \$1.84 per household per month, while it was \$2.60 per month for the combination of other illness episodes. The average person-days lost due to malaria and the combination of other illnesses were almost equal. If the financial costs of treating malaria and other illnesses are combined, this cost will deplete 7.03% of the monthly average household income, with treatment of malaria illness alone depleting 2.91%. Thus, malaria is a big contributor to the economic burden of disease, in malaria holo-endemic communities.

A more holistic approach to the study of the effects of malarial was presented by World Health Organization (WHO/TDR) (2003), through the work of Goodman et al (2003) and Janet(2003) , The two papers identified four main categories of variable for accessing the impact of malarial, namely;

- Resources cost of malaria
- Characteristic of demand for prevention and treatment of malaria.

- Economic evaluation of malaria
- Evaluation of the whole system level.

With the above it became easy to identify socioeconomic determinate of malaria transmission, characteristics of the demand for malaria prevention and treatment of malaria” and the associated economic implications.

Evidences from Theoretical Literature

Some Microeconomic studies have focused on impact of malaria at the level of the productive unit, such as the household or firm. The common method of estimation employed was been to sum the direct costs of expenditure on prevention and treatment and the indirect costs of productive labor time cost. Evidence on direct costs suggests that household can spend quite substantial sums on prevention and especially treatment. However the overall evidence on the microeconomic impact of malaria is patchy and weak, and there are many problems in using such data to reflect the burden to society or the potential benefits from control. Most studies have generally focused on febrile illness, overestimating the costs of uncomplicated malaria but underestimating the costs of severe illness.

Malaney, P. et al (2004), explained that macroeconomic analyses indicate that malaria inhibits long-term growth and development to a degree that was previously unimagined. There are at least three potential explanations for the magnitude of this effect and for the discrepancy between these results and those of microeconomic studies. First, although some hypothesis states that malaria causes poverty, causation runs in the other direction as well. Many countries are too poor to afford the kinds of malaria interventions that enabled such wealthier countries as the United States and Italy to eliminate transmission of this infection from within their borders. The causal effect of malaria on poverty cannot readily be isolated from the effect of poverty on malaria. A second econometric problem lies in the effect of such confounding factors as climate that may drive both poverty and malaria. A third explanation for the gap lies with a failure of traditional microeconomic methods to incorporate broad costs of the disease.

Most studies assumed that value of a day of work lost could be treated as the gain that would result if malaria were reduced or eliminated. There are problems with this assumption. First, the potential for substitution of labour crucially affects whether or not the loss of time is translated into a loss of output. At times of the years when there is underemployment or unemployment, substitution may be feasible without any consequential loss of output, since the marginal productivity of

unemployed labour is zero. However, a study on the Gezira, in Sudan showed a contrary. Nur and Mahian (1988) found that malaria affect productivity through its affect on;

- Work capacity (Since repeated malaria attacks may cause disability);
- Decisions on land use (in terms of extent of land cultivated and choice of crop);
- Labour quality (Since malaria can affect the cognitive development school performance of children).

Research Methodology

Data Measurement, Model and Estimation Procedure

In line with the overall objective of this study, two types of data were employed. Time series data on cost, public expenditure and population of reported case of malarial treatment morbidity and mortality were obtained from the WHO, and health records of public and private healthcare providers in the state, while data on household expenditure, absenteeism and income lost as well as private cost of treatment were obtained from the survey carried out by means of a close-ended pre-coded questionnaire designed for the purpose of this study. For the purpose of this study stratified simple random sampling was used with income and dwelling type as the stratification factors. Three main strata were identified; (High Income; Middle Income; Low Income). A total of nine thousand households (9000) were sampled-three hundred (3000) per stratum and which were drawn across the three senatorial districts (Kwara Central, Kwara North, Kwara South). A close-ended pre-coded questionnaire was designed to conduct a household health survey.

The Model

This study is essentially a binary response study, were the linearity and normality assumptions are clearly not realistic because of discrete response variables are binary variables and counts where the number of events can happen in a predetermined time period.

For a binary variable y_{ij} that has probability μ_{ij} for outcome 1 and probability $1 - \mu_{ij}$ for outcome 0, the mean is

$$E (y_{ij}) = \mu_{ij}$$

and the variance is

$$\text{Var} (y_{ij}) = \mu_{ij} (1 - \mu_{ij}).$$

The variance is not a free parameter but is determined by the mean. This has led to the development of regression-like models that differ from the usual multiple linear regression models and that take account of the non-normal distribution of the response variable, its restricted range, and the relation between mean and variance. The best-known method of this kind is logistic regression, a regression-like model for binary data.

Probit regression is one of the several statistics tool capable of modeling a binary response and will be applied to the data obtained from the field work.

In linear probability model, $Y=1$ and the resulting estimate for this probability can be less than 0 and or greater than 1

In these cases, I constraint the probability in a usual way,

$$0 \leq \text{Pr} (Y = 1/x) \text{ for all } x \dots\dots\dots (1)$$

$$\text{Pr} (Y = 1/x) \text{ to be increasing (not necessarily linear) in } X \text{ (for } B_1 > 0) \dots\dots\dots (2)$$

This requires a nonlinear functional form for the probability.

The probit model must satisfy these conditions,

$$0 \leq \text{Pr} (Y = 1/x) \leq 1 \text{ for all } X.$$

$$\text{Pr} (Y = 1/x) \text{ to be increasing in } x \text{ (for } B_1 > 0).$$

Probit regression models the probability that $Y = 1$ using the cumulative standard normal distribution function (CDF) evaluated at

$$Z = B_0 + B_1 x \dots\dots\dots (3)$$

$$\text{Pr} (Y = 1/x) = \Phi (B_0 + B_1 x) \dots\dots\dots (4)$$

Where Φ is the cumulative normal distribution function (CDF)?

$\text{Pr} (Y = 1/x)$ means the probability that an event occurs given the value (s) of x or explanatory variable, where Z is the standard normal variable i.e. $Z \sim N (0, \sigma^2)$.

To estimate this model the household variable is considered as the dependent variable. Therefore the household variable is measured in three folds i.e. Mortality Rate (MR), Private Expenditure (PE), and Productivity Rate (PD). The malaria epidemic variable which is measured as the likelihood of the occurrence of malaria infection in a household (MI) is used as the core independent variable. Furthermore, selected demographic variables of the household are used as the independent variables.

Thus the equation for the dependent variables is expressed these formats,

Model 1:

$$PD = \beta_0 + \beta_1 MI + \beta_i X_i + \varepsilon_i \dots\dots\dots (5)$$

Where PD is the rate of production of the average household

MI is the Malaria epidemics and X_i is a vector of household characteristics that affect productivity.

The above model seeks to determine, primarily, the effect of malaria infection (MI) on the productivity rate (PD) of the average household,

Model 2:

$$PE = B_0 + B_1 MI + B_2 x_i \dots\dots\dots (6)$$

Where PE is the private expenditure of the average household the model seeks to determine, primarily, the effect of malaria infection (MI) on the private expenditure (PE) of the average household, and X_i is a vector of household characteristics that affect household expenditure

Model 3:

$$MR = B_0 + B_1 MI + B_2 x_i \dots\dots\dots (7)$$

Where MR is the mortality rate of the average household

The above model seeks to determine, primarily, the effect of malaria infection (MI) on the mortality rate (MR) of the average household. To obtain information on M_i the malaria index, as well as B_0, B_1, B_2, B_3 , we take the inverse of equation (7)

$$I_i = \Phi^{-1}(I_i) = F^{-1}(P_i) \dots\dots\dots (8)$$

$$= B_0 + B_1 x_1 + B_2 x_2 + B_3 x_3 \dots\dots\dots (9)$$

Where Φ^{-1} is the inverse of CDF

The household's variables were measured as follow:

- Monthly household expenditure (HE), this measured in proxy by the proportion of household head income that is expended on the daily needs of the household.
- Productivity rate of household (PD): this is proxy by the number of times household member have been incapacitated in areas of work and school, and household activities;

- Mortality rate (MR): This is measured in proxy as the number of deaths occurring in a household.

Furthermore, the malaria epidemic variable was measured in proxy as the likelihood of a member of a household having malaria, and it's denoted by MI i.e. Malaria Infection. The malaria epidemic variable (MI) is considered as the independent variable in this study. Three separate regression models were developed to determine, primarily, the effect malaria epidemic (MI) on average monthly expenditure (HE), productivity (PD), and Mortality rate (MR) of the average household. And also to determine which of the other afore-mentioned independent variables have any sort of effect on the household variables.

Results and Interpretation

It is important to note at the on-set, that all the inferential statistics are in consonant with a priori expectations. The result obtained in respect of the household characteristic shows that 40.75% of households headed by individuals of ages 41 to 50 years have been infected with malaria over the last 12 months, while 27.67% of those headed by individuals of ages 51 to 60 years have been infected with malaria over the last 12 months. Also, about 17.49% and 11.04% of households headed by individuals less than 30 years old and ages 61 to 70 years respectively have been infected with malaria over the past 12 months, while only 3.06% of households headed by individuals that are 70 years and above have been infected with malaria over the past 12 months. This further indicates that about 4 out of every 10 households headed by individuals aged 41 to 50 years, and about 3 out of every 10 households headed by individuals aged 51 to 60 years are likely to have experienced the malaria epidemic. Hence the infection level of these could possibly lead to a high mortality rate among these groups of households, and much more to their respective welfares.

In the same vein about 87.46% of households headed by males have been infected with malaria over the last 12 months, while about 12.54% of those headed by females have been infected with malaria over the last 12 months. This could imply that the male-headed households are more vulnerable to the malaria epidemic as against the female-headed households, such that about 9 out of every 10 male-headed households is likely to have experienced the malaria epidemic while about 1 out of every 10 female-headed households is likely to have experienced the malaria epidemic.

On the other hand, the malaria infection rate based on the marital status of the heads of households surveyed indicates that 74.21% of households

headed by married individuals are infected by malaria, while 17.02% of single-headed households are infected by malaria. Furthermore, the households headed by widowed and divorced individuals account for 5.29% and 3.47% of the malaria infection rate of the entire households surveyed. This could imply that households headed by married individuals are more prone to the malaria epidemic probably because of the size of their respective households as against that of the other households represented in the survey. Hence, this could likely result to high mortality rate among household members headed by married individuals, and also increase in the level of expenditure as regard illness especially for that of malaria. More importantly, there's high likelihood that the productivity of these set of households could be severely affected.

Education characteristics indicated that 58.44% of households headed by BSc/HND holders have been infected with malaria over the last 12 months. This group of households has the highest rate of malaria infection when compared to the others i.e. households headed by Primary, Secondary, Diploma/OND, etc, holders. Furthermore, about 18.34%, and 15.91% of households headed by Diploma/OND, and Secondary certificate holders have had malaria infection over the past 12 months. Again, households headed by Primary, Arabic/Informal certificate holders, and those with no form of education at all account for about 2.27%, 2.11%, and 2.92% of malaria infection as shown by the survey respectively.

This trend seem odd in that household heads with BSc/HND should be more enlightened in matters regarding health and otherwise, thus there malaria infection rate should not be this high. Therefore, this could be due to other factors that transcend the educational background of the household heads e.g., location of residence, financial base of the household, personal/family values, ethnic culture etc.

The malaria infection rate of households based on the occupation of household heads shows those civil servants, business individuals, and those classified as "others" account for about 24.23%, 24.07%, and 20.49% of malaria infection respectively. Also, households with household heads as private workers, pensioners, and farmers account for about 16.26%, 12.85%, and 2.11% of malaria infection respectively.

This trend shows a distinct line between civil servants, business individuals, and "others" and private workers, pensioners, and farmers. Thus, the households headed by the former are more prone to suffer from malaria infections than the latter households.

The household headed by individuals who do not have "on the job" medical service have a higher malaria infection rate of 67.40%, while households headed by individuals that have "on the job" medical service have a lower malaria infection rate of about 32.60%. This trend clearly implies that "on the job" medical service gives some sort of edge against increased malaria infection, such that household members and heads respectively could take advantage it to ensure clean bill of health. Evidently, the same can't be said for those who do not have "on the job" medical service, thus they are likely to be more exposed to the burden of malaria infection.

In the same vein, malaria infection rate of households based on the national health insurance scheme (NHIS) status of its respective heads indicates that households that are covered under the NHIS initiative have a reduced malaria infection rate of about 34.66%, while households that are not covered under the NHIS initiative have a high malaria infection rate of about 65.34%. Thus, the NHIS status of the average household head could likely have some health implication on the members of their respective households.

Furthermore, this difference in malaria infection could equally be due to other related benefits that accrue to individuals making use of the initiative in terms of lower expenditure on treating malaria infection, quick and unrestricted access to health facilities irrespective of the individual's location however remote-like it may be.

Malaria Epidemic and Household Productivity

The results presented below in tables 4.1, 4.2, and 4.3 are summary output tables of the logit regression functions for measuring the effect of malaria epidemic (MI) on households using productivity (PD) as the dependent variable.

Table 4.1 above shows the effects of malaria epidemics on the productivity of the households. The constant has a coefficient of 3.824707 with a standard error of 0.903813 and Z- statistics of 4.231276. It can be noted that the standard error value is less than half of the coefficient value and the Z-statistics is greater than the 1.96 value at the critical level. Thus this constant is significant. The variable considered next is the malaria epidemics (MI). The coefficient of this is -0.146654 with a standard error of 0.059275. This value is less than half of the coefficient when they are compared. The Z- statistics is -2.474147. This is more than the 1.96 critical Z at infinity. Thus this variable can be said to have an inverse relationship with productivity. In fact, it portrays that, as malaria epidemics increases by 10%, productivity will decrease by 1.4%. The coefficient (0.142057) of

Age as household variable has a standard error of 0.375545 which is more than half of the coefficient signifies that age has positive but not significant effects on the productivity of the household. The coefficient of Households' size (HS) (-0.013894) has a standard error of 0.383778 and Z statistics of -0.036204 signifies that the variable is a negative but not significant determinant of productivity. Treatment cost of malaria (TC) has a negative and significant effect on productivity. The coefficient of -0.416028 has a standard error of 0.120260 and a Z statistics of -3.964809. All these satisfy the conditions of significance. Thus, the coefficient is a negative and significant determinant of productivity. The next variable is sex. It has negative and significant impact on productivity as the coefficient is -0.114484 and the standard error is 0.009781, and this is less than half of the coefficient value. The next variable, which is marital status (MS), has a positive but not significant impact on productivity (see Table 4.1 above). The major statistics used to evaluate the model are the McFadden R² that is 0.628680 and the LR statistics of 19.39437 and its probability; Prob. LR statistics of 0.003547. These show that the model is significant.

Table 4.1: Regression Result for Model 1: Malaria and household Productivity

Variable	Coefficient	Standard Error	Z-statistics	P-value
C	3.824707	0.903913	4.231276	0.0000
MI	-0.146654	0.059275	2.474147	0.0134
Age	0.142057	0.375545	1.378268	0.7052
HS	-0.013894	0.383778	0.036204	0.9711
TC	-0.416028	0.120260	3.964809	0.0046
SEX	-0.114484	0.009781	3.275154	0.0023
MS	0.168924	0.139769	1.208593	0.2268

Source: Authors Estimation, 2010

McFadden R²=0.628680

LR Statistics= 19.39437

Prob. LR statistics =0.003547

Table 4.2 above shows the effects of malaria epidemics on households' expenditure. The constant has a negative effect on the household

expenditure and the treatment cost also has negative and significant impact as the households' expenditure increases as more members of the household is infected by malaria. This is evident from the coefficient of -0.667860 with the standard error of 0.040329 and Z- statistics of -5.582650 which indicates that the parameter is significant. The model itself is significant as the independent variable can explain 40% (being the only explanatory variable and the LR statistics is 5.833048 with its probability less than 0.05.

Table 4.2: The Effect of Malaria Epidemic on Household Expenditure

Variable	Coefficient	Standard Error	Z-statistics	P-value
C	-0.040735	0.117053	0.348007	0.7278
TC	-0.667860	0.040329	-5.582650	0.0004

Source: Authors Estimates, 2010

McFadden R²= 0.402324

LR Statistics= 5.833048

Prob. LR statistics =0.012343

Table 4.3 Malaria Epidemic and Mortality Rate

The results presented below in table 4.3 are summary output tables of the logit regression functions for measuring the effect of malaria epidemic (MI) on households using mortality rate (MR) as the dependent variable.

Variable	Coefficient	Standard Error	Z-statistics	P-value
C	0.519174	0.182626	2.842819	0.0045
TC	-0.048280	0.017502	1.996368	0.0395
Age	0.239919	0.049918	4.806240	0.0000
MI	0.153427	0.048510	3.162791	0.0016

Source: Authors Estimates

McFadden R²= 0.642875

LR Statistics= 50.71558

Prob. LR statistics =0.000000

The constant has a coefficient of 0.519174 and standard error of 0.182626. The Z statistics is 2.842819, confirming the significance of this

determinant. The treatment cost (TC) has negative but significant effects on the mortality rate without being location specific. The coefficient is -0.48280 and its standard error and Z- statistics are 0.017502 and 1.996368 respectively. The higher the size of house expenditure devoted to cost of treatment, the lower the mortality rate. Age is another determinant considered. Its coefficient is 0.153427 with the standard error of 0.048510; that is less than the value of the coefficient. Thus, the variable is a significant determinant of MR. The higher the age of the patient, the more the rate at which he or she is liable to die at the strike of malaria. This is in line with Mensah (2003), who observes that a patient's age, total expenditure, ethnicity, treatment costs and participation in the local credit scheme, significantly affected the choice of treatment for malaria and consequently the mortality rate of the patient. The last variable considered here is MI (malaria epidemics). The coefficient is 0.153427 with its standard error and Z- statistics being 0.048510 and 3.162791 respectively. It shows that the variable has a positive relationship with mortality rate. The model is significant as its LR has probability of 0.000000 which is even below 1% confidence interval.

Conclusions And Recommendations

The first major observation from this study is that differences in household costs of malaria are the product of complex relationships between social, economic and epidemiological Factors. The followings summarize these complex relationships:

1. Household members within the age bracket (group) 41-50 years have the highest percentage of malaria occurrence;
2. Male household heads have the highest occurrence of malaria infection;
3. Household heads within the age grade 41 to 50 years and 51 to 60 years are more vulnerable to malaria infection and share a higher percentage of the cost burden of other household members.
4. Educational attainment of Household member has no effect on the vulnerability to occurrence of malaria infection;
5. Malaria infection has negative effect on productivity. Other variables like household size, sex and treatment cost has negative effect on productivity, which is in consonant with *a priori* expectation (see also Brohult et al 1981, Shiff et al, 1996)

6. In the same vein treatment cost on all household illness showed a positive effect on household expenditure which means that the higher the treatment cost of malaria the higher the proportion household expenditure devoted to treatment.
7. Mortality rate showed that an increase in the case of malaria infection leads to an increase in mortality rate of households. This is also a function of age, treatment cost, and the ability to pay for the treatment cost.

Recommendations

The results obtained from this study compel the segmentation of recommendation into short-run and the medium-run. In the short-run the following recommendations are made;

1. Malaria control programs in Nigeria should be refocused to identify and target the poor because the incidence and impact is more on low income earners. This can be accomplished through treatment subsidy and free drugs for the marginal groups in the society;
2. Public programs of enlightenment on the need to prevent the infection, must be taken to all categories of people through the media syndication at a term that will be convenient to reach the different strata of the household rather than curing the infection;
3. Public and private sanitary system must be standardized and compliance to standard must be enforced through the age – old Sanitary Inspectors of the public health, redesigning of the drainage system and periodic fumigation of the entire to cover the mangrove, rain forests considered to be a good habitat for breeding mosquitoes;

In the medium-run the following recommendations are made: -

4. A much more systematic and carefully thought through effort is required to ensure that key differences in economic environments and malaria epidemiology are taken into account, and that both shorter and longer run consequences of malaria are considered. Such research should help to publicize and justify a major malaria control effort. However, this information, if suitably

disaggregated, can also be used to design and target control interventions. And much emphasis should be laid on the impact of malaria on the body system and the economy as a whole;

5. Finally, with continuing research and empirical studies done on this issue, more attention may be brought to policy makers so that in time drastic reduction in malaria cases and subsequently reduction in loss of lives to malaria will be realized. In future research, more advanced research tools may have to be developed to better capture the effect of malaria on productivity, economic growth and standard of living.

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