Malaria in Children: Implications on Economic Productivity of Nigeria.

> "The Mosquito comes in the night, alights on an exposed patch of flesh, and assumes the lunched, head-lowered posture of a sprinter in the starting blocks. Then she plunges her stiletto mouth-parts into the skin" Michael Finkel (2007).

Introduction

Malaria is the most clinically important disease worldwide with estimated 300 million to 500 million clinical cases annually. This according to the World Health Organization results in approximately 1.5 million to 2.7 million deaths. Ninety percent of the deaths occur in children under five years of age living in sub-Saharan Africa. In Africa some 3,000 children die of malaria each day, one every second (Finkel, 2007). In Nigeria, 60 million people experience malaria attack at least twice a year. The new data on Nigeria further reveals that 92 percent of this are pregnant women and children under 5 years because their resistant to the disease is low (CNL, 2007 and SPDC, 2007). The phobia that has greeted this malaria hyperendemic region is not unrelated to the fears that this number may double in the next one decade should there be no effective intervention.

According to the website *malariasite.com/malaria/children.htm*, children may not contact malaria in the first two months of life, due to the passive immunity of maternal antibodies. However, in endemic and hyperendemic areas, susceptibility to severe falciparum malaria increases with age from 0 to 10 percent during the first three months of life to 80 to 90 percent by one year of age and a mortality rate highest during the first two years of life. By primary school age asymptomatic parasitemia can be as high as 75 percent when a considerable immunity would have been developed. What really is malaria?

Malaria is a serious illness which sometimes leads to death. It is passed from person to person through the bite of a female mosquito. The mosquito according to Finkel (2007: 40), has a long, filament – thin legs and dappled wings; she's of the genus *Anopheles*, the only insect capable of harboring the human malaria parasite. Definitely, Anopheles mosquito is a ***she*** as male mosquitoes do not depend on blood, while female does to nourish their eggs.

In the past few years, interest of aid agencies and donors on the need to disable the malaria disease has been aroused by the existing calamitious evidence and the economic consequences apart from the health problem. The World Health Organization for example, has made malaria roll-back a major priority, while hundreds of millions of dollars have been donated by Bill Gates. Various programmes to roll-back malaria have also been put in place in recent times in various countries.

In June 2005, President George Bush of the US launched the President's Malaria Initiative (PMI) and pledged to increase U.S. funding by more than $1.2 billion over five years to reduce deaths due to malaria by 50 percent in 15 African countries. Angola, Tanzania and Uganda were expected to be the first beneficiary of the U.S. expanded programme. On 25th April 2007, the African Malaria Day was equally celebrated in Nigeria with a general theme – "Leadership and Partnership for Results". It focused on the need to work in partnership among stakeholders- oil-multinational corporations, governments and communities to reverse the progress of malaria and make a significant impact to free communities from malaria. Some multinational oil companies that have joined in the war against the disease in Nigeria are the Shell Petroleum Development Company (SPDC) and Chevron- Texaco Nigeria Limited (CNL). SPDC has in recent

times provided 66,116 doses of *Artemisinin-Combination Therapy* (Larimal) for treatment of malaria, free to children under 5 years, 11,420 doses of *Sulfadoxine Pyremethamine* (SP) for intermittent preventive treatment (IPT) to be administered free at the Antenatal Clinics. CNL on the other hand has been in the vanguard of information dissemination on the causes and prevention of the disease and medical consultation. CNL has in some instances offered free treatment on the one hand and on the other provided anti-malaria drugs to health centers, clinics and hospitals. The three-tiers of government (Federal, State and Local) in Nigeria have also distributed mosquito nets treated with insecticides. As noted in Finkel (2007), nets can cut mosquito by half and child deaths by a third. These actions are driven and energized by the spirit of partnership and social responsibility. Despite these efforts the cost of prevention and treatment of malaria still consumes chunk of household's valuable scarce time and income, wealth, labour productivity of market participation.

The objective of this paper concentrates on the productivity loss due to the epidemic and implications of this on the Nigerian population growth. The rest of the paper is divided into five sections. Following the introduction, section 2 is a brief survey of some issues in literature. Section 3 discusses the socio-economic characteristics of malaria in Nigeria. In section 4 the data and methods are presented, while section 5 discusses the results and their policy implications. Section 6 concludes the paper.

Brief Issues in the Literature on the Impact of Malaria

Recent researches on the impact or burden of malaria especially of children on productivity is mute. Most previous literature which emanated from one or two conferences concentrated on the goal of developing one or more effective vaccines in

prevention of malaria. Others, apart from attempting to develop vaccines explored the potentials for conducting eventual large-scale field trails in the countries where malaria is endemic and prevalent (see for example, Buck, 1986; Shepard et al., 1991; Hammer, 1993; and Alaba and Alaba, 2002). Some other studies on malaria concentrated on malaria and pregnancy (for example Lawson and Stewart, 1967; MacGregore 1984 and 1987; Spitz, 1959; Bray and Anderson, 1979; and Ngassa, 2000). These portray the gap in the literature in ascertaining the economic cost of malaria and painful loss in population growth.

The literature on ill-health establishes a remarkable correlation between malaria in children and time as well as productivity loss of caregivers (Mccubbin et al, 1979; Michalopoulos, 1992). Alaba and Alaba (2002) in a study estimated the value of productivity time loss of female caregivers as a result of malaria attack on children in Nigeria. They reported that malaria lasts an average four to six days in affected patients which also amounts to loss of same number of productive days by the caregiver. The survey which monetized time loss per malaria episode revealed that malaria attack is expensive for sustainable welfare at both the household and national levels, since it affects productive time and eventual earnings. The summary is that household productivity, income and time losses are due to the attack. Thus, malaria is not only a health problem; it is also an economic problem.

Alaba and Alaba (2002) study used a hospital-based survey of 1000 respondents in the malaria clinic of Adebayo hospital and the University College Hospital, both situated in Ibadan, Oyo State, Nigeria. The current study departs from it both in survey location and characteristics.

Sectoral Impact of Malaria and Productivity Interaction

Although the effects of malaria in children on the various sectors of the economy have not been systematically assessed in Nigeria, it is imaginable and evident. Figure 1, summarizes the discernable impact of malaria in children at different levels, ranging from the immediate impact on household and community to macroeconomic and sectoral impact. The first level impact is on the household which includes the individual and the community. The second level is the macroeconomic impact which defines the wider implications on the national economy.

Household and Community Level

At the household and community level, the malaria epidemic results in loss of income and di-saving as personal expenditure caused by malaria include money spent on insecticides, insecticide-treated mosquito nets, clinic fees and anti-malarial drugs. When a household is unable to meet up with the financial burden from health bills, other family members may be reached to off-set such bills. This further impoverishes household and community and may even drive poorer households deeper in suffering and aggravated poverty. Malaria in children also leads to children's productivity loss. Sickness in children has negative impact on attendance and academic performance. As a result children have difficult time passing their examinations or moving to another grade. This may lead to dropping out of school with its associated socio-ills like crime, prostitution, etc.

Malaria in children if not properly and adequately treated on time; it may result in child mortality and mobility. There is also evidence of households who probably lost their only child to the disease. In Africa, childlessness due to death of siblings are equated to bareness with its attendant socio-economical, psychological and societal

stigma. Consequences of such stigmatization and socio-emotional problems are early withdrawal from the labour force which not only results in productivity loss; it may even further reduce life-expectancy.

In Africa, when a household or an individual is bereaved, other siblings or family members and friends especially peer mates are expected to spend some time to commiserate with the bereaved. The period of mourning not only affects the bereaved or household productivity including time loss, it also extends to those persons within the community or neighborhoods of sympathizers.

Macroeconomic Level

The literature on the Macroeconomic Impact of Malaria disease in Children (MIC) in areas of endemicity and hyperendemicity is mute in Nigeria. This is because no known study has been done in this area on a national basis. Like any other sector, the health sector productivity declines when children of health employees are attacked by malaria disease. In addition, increased rates of malaria in children places a burden on health sector resources since such could even lead to reallocation of resources in favour of children anti-malaria drugs at a cost.

The impact of the epidemic on the various sectors is expected aggregatively affect the gross domestic product (GDP). Caring for sick children can wholesomely lead to substantial loss of workdays as affected caregivers are unable to work fully whether at the work place or farms as the case may be or even at home. Lower productivity can aggregatively result in reduced national and per capita income, fewer crops for consumption or sale and by extension food shortage and insecurity cum high imports. High imports also results in loss of foreign exchange not only on food imports but also on pharmacenticals. In this case the wealth of a country's residents is depleted and this has

serious constraint on its economic development. There are available reports that annual economic growth in countries with high malaria transmission has always been lower than in countries with malaria (www.malaria.org.zm/economic-burden.htm). It logically follows that since most afflicted age-group by this disease are children, then malaria in children thus lead to slow economic growth. When malaria mobility and mortality is multiplied by related cost, the impact on the health sector and the nation is enormous.

Demographic and Population Impact

The malaria epidemic is expected to significantly impact on the child's survival, mortality and life expectancy at birth. It is estimated that by the year 2020, the 400 to 900 million of children under the age of five who presently experience acute febrile episodes of malaria annually in Africa's hyperendemic and endemic continent would have doubled if effective interventions are not implemented (MIM, 2001).

Although this may reduce population growth slightly, it may be counter productive as fear of loosing children to malaria epidemic may even result in having more children as *undesired*. This could have a toll on the dependency ratio as the demand for public, social and welfare infrastructure may even aggravate and widen poverty and poverty cycle respectively, reduce standard of living and further slow down economic growth and development.

Socio-Economic Characteristics of Malaria in Nigeria.

Before addressing the basic socio-economic indicators of malaria in Nigeria, an overview of major demographic characteristics vis-à-vis her human development is necessary. Nigeria is located in West Africa and occupies a land area of 928,768 sq

kilometers with vegetation that ranges from mangrove forest on the coast to desert in the far north.

The 2006 census results estimated the Nigerian population to be over 140 million (African Economic Outlook, 2007), thus making her the most populous in Africa and the tenth most populous in the world. Crude birth rate (per 1000) is over 40.1. Given an average birth rate of 2.20 percent, annual births in Nigeria may be estimated to more than the sum total population of Botswana, Cape Verde, Equatorial Guinea, Seychelles, Sao Tome and Principe and probably in addition, Comoros and Djibouti. Such size may in some perspective not be healthy relatively in an effort to achieve the Millelium Development Goals (MDGs). Succinctly put, the size of Nigeria's population apart, the high degree of mismanagement of resources is one factor that has outpaced the government ability to provide adequate health and social services.

Nigeria's human resource development balance sheet indicates that her Gross National Income (GNI) per capita is $390.00 (US). The country's human development ranking is equally low. Her Human Development Index (HDI) ranking is 151 in 2002 and 158 in 2003 out of 178, thus representing a decline. The country ranks 6th and 7th as a petroleum exporter and producer respectively (Ayorinde, 2002).

In the area of reduction in infant and particularly under-five mortality, little progress has been made. Nigeria's rates of infant mortality (111 per 1,000 live births) and mortality rate of children under age 5 (194 per 1,000) are among the highest in the world. Malaria contribution to this profile is quite significant as it is next to no other disease as a major source of the mortality. Physician per 100,000 people is 30 while population per hospital bed is reported to be on the increase. According to Alaba and

Alaba, (2002), population per hospital bed was 1277 in 1993, 1632 and 1738 in 1997 and 1998 respectively. This increase according to their study is adduced to the growing resistance of malaria to drugs. Generally, a survey study by the country's National Bureau of Statistics (2005) reported that of persons that suffered illness in 2004, malaria was far the most common disease of Nigerians.

Malaria is prevalent and holoendemic throughout Nigeria and is remarkably an enormous problem. Transmission of malaria occur all year round in Nigeria with a high intensity, the rate is higher in the wet or rainy season than in the dry season (Salako, 1986: 133). Over the years, the malaria situation has not changed much although variations occur between different parts of the country especially between the South and North. In Nigeria, the *P.Falciparum* is the predominant species that cause malaria with about 96 percent of the disease related to it during the wet season.

Children of preschool age (under 5 years of age) are the most inflicted as the density of parasitemia is highest with this age groups in Nigeria. The average bouts in Nigerian children is four annually and increasing (National Malaria Control Plan of Action 1996-2001).

The magnitude of malaria incidence in recent times coupled with deaths resulting from it is in multiples of all other tropical diseases like Filiaris, Oncho and Schisto. Existing data revealed that malaria not only contributed over 90 percent of the cases of tropical diseases in Nigeria, malaria also inflicted the greatest stress on household given that it was the major or source of mortality (Alaba and Alaba, 2002).

In a report of a four week survey conducted in Delta State by the Centre for Population and Environmental Development (2005) on behalf of the Niger Delta

Development Commission (NDDC), and presented in Table 2, shows that fever/malaria accounted for over 71 percent of persons who were sick or injured. The other 28 percent is accounted for by diarrhea, accident, dental, skin, eye, ENT and others. The Table also revealed that most of the fever/malaria cases in the State were predominant in Bomadi, Patani and Ethiope West Local Government Areas of the State. These local government areas are oil producing which may imply that man-made activity (oil exploration) not only depletes the environment, transform hitherto fresh water swamp forests into mosquito breeding grounds and this consequently increases the prevalence of *P.falciparum* and hence the malaria disease.

The World Health Report (1999) as cited in Alaba and Alaba (2002) reported that as much as 13 percent of total small farming household expenditure in Nigeria is spent on malaria treatment. This has serious implications on the household feeding and labour market participation of caregivers.

Data and Methods

The methodology for generating and analyzing data of this study follows the lead by Laah and Mamman (2002) and Alaba and Alaba (2002). The data was obtained from well completed 762 of 1,000 administered questionnaires. The questionnaire was specifically designed to obtain information on caring and treating, productive time or income loss to caring and treating malaria in children. The prevalence of malaria among other diseases, age and by sex was also determined. The questionnaires were administered in three main urban towns of Delta State[1], namely Warri, Ughelli and Agbor (see Figure 2), between March and August 2007. These towns are easily accessible by

neighbouring villages given the fairly good network of roads in Delta State. In each of the towns, including the neighbouring villages, 6 settlements were chosen by using a systematic sampling method. A listing of the settlements was done in alphabetical order and the choice of every 2nd number settlement was chosen until the six settlements were selected. In each of the six settlements, the 3rd numbered household to both sides of the major street was selected.

The target of the survey was children between ages 0 and 5 on the one hand and between ages 0 and 14, while the primary respondents were parents and or guardians. The questionnaires were coded and analyzed using simple descriptive statistics. A simple descriptive analysis of the distributions and cross tabulations of variables was also done. To complement the required information from questionnaire, data from hospital records obtained from the three Central Hospitals located in each of the towns were used.

Results and Discussion

Demographic and Socio-Economic Characteristics of Respondents.

The sample properties of respondents by demographic and socio-economic characteristics show that nearly 87 percent of the 762 respondents are biological mothers within the age bracket of 19-38 years. This pattern is not only common in all towns under study; it is also a reflection of the child bearing age brackets of women in Delta State. Disaggregating this group further by occupation or activity shows that 612 of them are self-employed (80.3 percent are petty-traders), 88 are government employees and 62 are unemployed. Again, this pattern of employment composition is replicated in each of the towns.

Literacy rate is quite high as only 11.5 percent have not had western education, of this 71.2 percent of perceived 'illiterate group', 24 percent of them could spell their full names even though they could neither differentiate alphabets, nor write the spelt names. The distribution of respondents by religion shows that 82.57 percent are Christians, 0.29 percent are Muslims while other 17.44 percent are traditional religions worshipers and pagans. The high literacy rate relatively to the proportion of persons who are self employed and unemployed implies that the informal sector is the major employer of labour in Delta State, Nigeria.

Estimate of Time and Productivity Loss [2]

Further desegregation reveal that the mean working hour is 10 hours and 9 hours for self-employed and government employees respectively. While the unemployed use average of 10 hours in domestic activities. The calculated mean working hours for this group of biological mothers is 9.94 hours while for the entire sample or respondents, it is 8.92 hours. The implication of this is that biological mothers or 'women' not only constitute the largest number of persons who are children caregivers, they also put in more hours of work in economic activities and thus loose more hours of work than men when a child is sick at least due to malaria attack.

The mean income of the respondents is N698.12 (US$5.54) per day for the self-employed and for the government employee; it is N652.45 (US$5.18). The daily domestic activity was quantified by using hourly paid of hired labour as proxy. The minimum pay-proxy is calculated at N305.75 per day.

Total income lost is obtained by using the minimum pay proxy (N305.75) per day to multiply the average sample number of hours lost (8.92). The product is further multiplied by six day lost due to care giving. The total income lost is N8,983,693.30

(US$71,299.16) per bout of malaria. This income lost if calculated on the basis of 3 bouts of malaria attack on the approximately 50 percent of the population that is said to experience malaria attack annually, may run into average loss of millions of dollars in income and productivity. Such a loss is a withdrawal from the national product and income.

The income and time loss for the average government employee apart from warnings and queries, the government bears the cost of time and income loss from absenteeism of workers due to care giving. In relation to time lost, millions of hours are also complementaringly eroded.

Impact on population

The percentage death distributed by age and sex is reported in Table 5. The Table reveals that of the total number of malaria cases reported, 0.30 percent death was recorded. A further disaggregation indicates that 78.22 percent of the deaths were children under 15 years of age and 58.89 percent of the total deaths are children under 5 years. Relatively to sex, 32.89 percent out of the 58.89 percent death of the children less than 5 years are boys while girls accounted for the other 26 percent.

A 0.41 percent death of children less than 15 years was recorded relatively to the number of cases under the same age bracket that was recorded. The implications of this are:

(a) the number of death cases reported is less than 1 percent; this may be as a result of improved access to medical facilities and environmental conditions.

(b) in terms of gender comparison, boys and indeed men recorded more death than girls or women. This as observed initially opens another window for further research.

(c) the low record of death resulting from the reported cases and relatively to previous data and population growth rate (2.17%) implied that mortality due to

malaria has declined. This however should be taken with caution as the records were obtained from central hospitals in three cities of Delta State. More unrecorded death may be prevalent in the rural areas where medical facilities are lacking and where majority of Nigerian population also live. One lesson from this is that emphasis in the war against malaria should now concentrate in the rural areas.

Distribution of Malaria by Age and Sex

The percentage distribution of malaria by age and sex is reported in Table 6. The distribution shows that 56.9percent of all reported cases are children under 15 years of age and majority of them are boys. The children also had at least three average bouts of malaria attack annually. The prevalence of malaria in children under 15 years of age seems to have peaked in age group 6-14. Relative to the entire distribution, the prevalence of malaria is also more in children under 15 than adults. 56.9 percent of all cases surveyed are children under 15 years of age. It follows that malaria attack declined with increasing age.

Sex Ratio

A sex ratio of children under 15 years of age was also computed as 1147.98 percent. The sex ratio according to Laah and Mammam, (2002:97) relates the number of malaria in male children to 100 female children that are less than 15 years. The formula is given as

$$SR = \frac{X_{MK}}{X_{FK}} * 100 \qquad (1)$$

Where SR is the sex Ratio, X_{mk} is the number of malaria male children in the group k and X_{fk} is the number of female children who had malaria in the same group k. A sex ratio of less than 100 means that there are more female than male children who had

malaria attack, while if SR is equal to 100, it means that there is no difference in prevalence by sex. Since an SR of 114.80 is reported, it can be concluded that malaria in children is more prevalent in male children in Delta State. This also goes to confirm Alaba and Alaba (2002) study of malaria in children in Oyo State of Nigeria. One implication of this consistency is a pointer for further studies why malaria in children is more prevalent in male and behold the male folk than girls and women generally.

Health Care Consultation

The majority of respondents made their first consultation at hospitals and dispensaries in the first instance. Further disagregation reported in Table 7 revealed that if hospitals, dispensaries and pharmacies are seen as formal and more appropriate venues for treatment of malaria, then over 55 percent of respondents had access to such institutions. It also makes the control of the disease easier.

In regards to the cause of malaria, 47.71 mentioned mosquitoes, 20.11 percent considered malaria to be caused by dirty water while 22.62 percent adduced the cause to cold. Although 2.92 percent mentioned change of weather as the cause of malaria, what is interesting to note about the responses is that over 70 percent associate the causes of the disease with environmental conditions rather than superstitious or supernatural forces. It is interesting to note that more than 60 percent of families in the lower quintile had first consultant at such institutions.

Conclusions

In this study, efforts were made estimate the economic costs (in form of income and time productivity loss) of malaria in children. The estimated results indicate that women loose more hours of work than men in caring for children when they are attacked

by malaria and as such loose more productive time. Malaria in children leads to a significant loss in Gross National Product (GNP) in Nigeria, however, the amount was not estimated for.

Although poor environmental conditions were associated with the cause of malaria disease, the estimated results indicate that death rate in children and people generally due to malaria attack declined during the period of study. The reasons can be adduced to the aggressive awareness campaigns of the need to live in cleaner and healthy environments, access to improved anti-malaria drugs among others.

Consequent upon the above, it is recommended that efforts to completely roll-back malaria (in form of information dissemination, provision of free medical treatments and drugs for persons who have been attacked by the disease, provision of more health centers, etc.) in Nigeria should be sustained with more attention focused on the rural communities and slums where most poor people live in urban cities. The efforts should be properly coordinated and packaged to complement the partnership of stakeholders concern in achieving a malaria free nation.

Agenda for Future Research

Male children and men generally are reported to suffer more from malaria sickness than girls and women. Why? This opens another window for future research.

Endnotes

1. Delta State is one of the 36 states of Nigeria and situated in the Niger Delta Region.
2. Productive time and income loss depends on the nature of work and terms of employment for the parental guardian; while for the child, it depends on the age (school pupil). Losses were calculated per bout of malaria.
   Income loss = Wage paid for hired workers (for those who are self employed and are able to hire workers) or average daily wage loss (for those who are self employed but could not hire workers due to some circumstances) during working days.
   Time Loss = Average number of hours the caregiver is out of work due to malaria multiplied by number of working days.
   Time loss by school child: Number of hours multiplied by number of days out of School due to malaria.

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Appendix

Table 1: Selected Socio-Economic Characteristics of Nigeria

	1999	2000	2001	2002	2003	2004	2005
Infant mortality per per 1000	N.A.	115.3	114.8	114.4	113.1	111.9	110.5
Maternal mortality rate per (100,000 live birth	704	800	N.A.	N.A.	N.A.	N.A.	N.A.
Life expectancy @ Birth (Total Years)	N.A.	43.8	43.6	43.3	43.5	43.7	43.8
Life expectancy Male years	N.A.	43.3	43.2	43.1	43.3	43.5	43.7
Life expectancy Female years	N.A.	44.3	43.9	43.5	43.7	43.8	44
Infant mortality rate (1,000)	N.A.	115.2	114.8	114.4	113.1	111.9	110.6
Under five mortality rate (1,000)	N.A.	201.98	201.21	200.44	198.17	195.91	193.65
Physician per 100,000 people	N.A.	30	N.A.	N.A.	N.A.	N.A.	N.A.
Human Poverty Index (HPI –I) Value (%)	N.A.	34.9	34	35.1	38.8	N.A.	N.A.
Public Expenditure on health (as % of GDP)	N.A.	1.47	1.41	1.2	N.A.	N.A.	N.A.
GNI per capital (US$)	N.A.	260	300	350	390	N.A.	N.A.
Population ('000)	N.A.	117608	120,367	123,134.30	125,912.30	128708.9	131529.7
Crude Birth Rate (per 1000)	N.A.	42.77	42.39	42.02	41.52	41.01	40.51
Crude Death Rate (per 1000)	N.A.		19.23	19.31	19.39	19.2	18.82
Population Growth Rate	N.A.	2.37	2.32	2.27	2.23	2.2	2.17
HDI Rank (out of 174)	N.A.	148	152	151	158	N.A.	N.A.
Gini coefficient	N.A.	N.A.	N.A.	N.A.	0.4882	N.A.	N.A.
Female in labour participation	N.A.	N.A.	35.7	35.8	35.9	N.A.	N.A.
Male in labour participation	N.A.	N.A.	64.3	64.2	64.1	N.A.	N.A.
Total labour participation	N.A.	N.A.	40	39.9	39.8	N.A.	N.A.

Source: African Development Bank (2006) Gender, Poverty and Environmental indicators on African Countries Tunis: Tunisia.

Table 2: Percentage Distribution of the Sick or Injured in the Last Four Weeks Preceding the Survey According to Nature illness

Administrative/political and Ecological Units	Fever/ Malaria	Diarrhoea	Accident	Dental	Skin	Eye	ENT	Others
Delta State	71.2	8.5	2.3	1.3	3.4	3.1	0.6	9.6
Local Government Area								
Aniocha North	75.0	1.9	0.0	0.0	0.0	1.9	0.0	21.2
Aniocha South	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0
Bomadi	93.7	2.0	0.5	1.0	0.5	0.5	0.0	2.0
Burutu	73.2	5.4	0.0	2.5	7.6	3.2	0.0	8.2
Ethiope East	37.0	26.0	2.0	2.0	2.0	15.0	1.0	15.0
Ethiope West	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ika South	38.9	22.2	11.1	11.1	0.0	16.7	0.0	0.0
Ika North East	59.5	2.4	33.3	2.4	0.0	0.0	2.4	0.0
Isoko North	83.1	6.1	0.7	0.7	2.0	2.0	0.7	4.7
Isoko South	74.7	21.2	1.0	0.0	0.0	3.0	0.0	0.0
Ndokwa East	53.8	7.7	1.9	3.8	0.0	11.5	1.9	19.2
Ndokwa West	80.0	0.0	5.0	0.0	0.0	10.0	5.0	0.0
Okpe	75.9	20.7	0.0	3.4	0.0	0.0	0.0	0.0
Oshimili North	72.0	9.0	0.0	0.0	0.0	4.0	1.0	14.0
Oshimili South	76.2	7.1	4.0	0.0	0.0	1.6	0.0	11.1
Patani	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sapele	57.1	9.5	19.0	4.8	0.0	0.0	9.5	0.0

Table 2 Continued

Udu	85.3	2.8	2.8	0.0	0.0	7.3	0.9	0.9
Ughelli North	62.0	29.6	0.0	0.0	4.2	0.0	0.0	4.2
Ughelli South	63.1	5.8	1.3	0.0	12.1	1.3	0.3	16.1
Ukwuani	44.4	22.2	11.1	0.0	0.0	0.0	5.6	16.7
Uvwie	82.4	10.3	4.4	2.9	0.0	0.0	0.0	0.0
Warri North	65.9	15.3	4.7	4.7	0.0	1.2	1.2	7.1
Warri South	59.4	2.9	1.4	0.0	0.0	11.6	1.4	23.2
Warri South West	67.8	7.2	1.3	3.3	0.0	0.0	0.7	19.7
Senatorial District								
Delta North	75.9	10.8	2.0	1.2	0.0	3.0	0.0	6.4
Delta Central	72.7	8.0	2.3	0.9	2.0	0.0	0.0	12.9
Delta South	71.0	9.0	2.4	1.3	0.0	0.0	0.0	16.3
Ecological Zones								
Barrier Island Forest	70.7	28.3	4.3	4.5	2.5	2.5	0.6	5.6
Mangrove Swamp Forest	76.5	5.3	0.0	3.5	0.0	0.9	0.0	5.8
Freshwater swamp forest	68.9	5.8	0.0	1.2	10.0	0.0	0.0	13.4
Lowland Rainforest	71.7	11.3	12.5	0.9	0.0		0.0	4.6

Source: Centre for Population and Environmental Development. Fieldwork, 2003

Table 3: Economic Activity of Biological Mothers

Activity	**Towns**			
	Agbor	**Ughelli**	**Warri**	**Total**
Self employed	155 (29.75)	167 (32.05)	199 (38.20)	521 (89.21)
Government employed	8 (22.86)	13 (37.14)	14 (40.00)	35 (5.99)
Unemployed	3 (10.71)	6 (21.43)	19 (67.86)	28 (4.80)
Total	166 (28.42)	186 (31.85)	323 (39.73)	**584**

Source: Field Survey, 2007

Table 4 Average Loss Per Malaria Attack in Children

Employment Status	Time loss (hrs) per day	Cost in Naira	Cost in US$
Self-Employed	10	698.12	5.54
Government Employee	9	652.45	5.18
Minimum Pay Proxy	8.92	305.75	2.43

Source Field Survey, 2007 **Conversion N126 = $1**

Table 5: Percentage Death Distribution by Age and Sex

Male					Female					
Under 1yr	1-5yrs	6-14yrs	15+	Total	Under 1yr	1-5yrs	6-14yrs	15+	Total	Grand Total
60 (13.33)	88 (19.56)	50 (11.11)	61 (13.56)	259 (57.56)	48 (10.67)	69 (15.33)	37 (8.22)	37 (8.22))	191 (42.44)	450

Source: Computed from Hospital Records

Table 6 : Percentage Distribution of Malaria by Age and Sex

Male					Female					
Under 1yr	1-5yrs	6-14yrs	15+	Total	Under 1yr	1-5yrs	6-14yrs	15+	Total	Grand Total
11423 (14.14) [7.59]	14423 (17.86) [9.58]	19932 (24.67) [13.24]	35001 (43.33) [23.26]	80779 (53.67) [53.67]	9651 (13.84) [6.41]	14755 (21.16) [9.80]	15465 22.18) [10.28]	29858 (42.82) [19.84]	69720 (46.33)	150508

Source: Computed from Hospital Records

Table 7 Health Care Consultation by Service Provider

Institution	**Quintile**					**Total**
	1	2	3	4	5	
Hospital	14.93	16.11	16.12	23.62	27.78	20.48
Dispensaries	22.82	22.89	16.12	13.10	9.23	16.17
Pharmacy	18.81	16.87	18.33	17.61	22.34	18.97
Road side medicine	18.77	19.06	20.79	18.26	15.67	18.35
Self medication	22.82	22.89	16.12	13.10	9.23	16.17
Traditional attendant	3.97	2.98	3.69	2.70	2.90	3.21
Others	5.30	5.73	6.41	7.80	8.18	6.82
Total	100	100	100	100	100	100

Source: Field Survey, 2007

Table 8: Distribution of Respondent Opinions Concerning What Causes Malaria in Children.

Causes	**Number**	**Percent**
Mosquitoes	323	47.71%
Dirty water	136	20.11%
Heat	22	3.27%
Change of whether	20	2.92%
Cold	153	22.62%
Superstitious Beliefs	19	2.78%
Don't know	4	0.59%
Total	**678**	**100%**

Source: Field Survey, 2007

Figure 1: Specific Impact of Malaria in an Economy

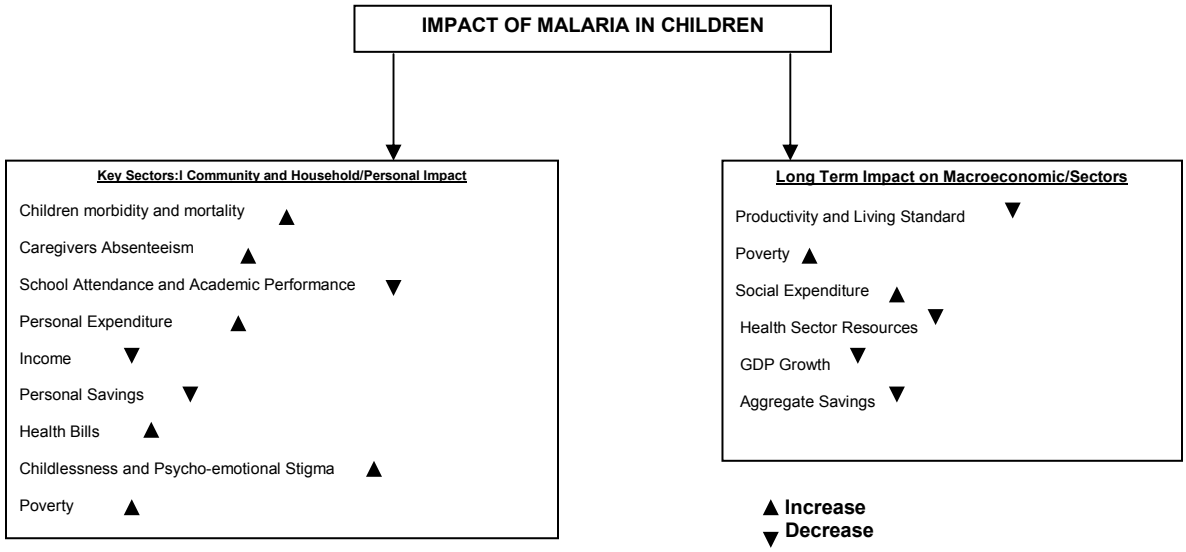

Figure 2: Map of Delta State, Nigeria Showing Study Area