Original Research Article

Economic Effect of Malaria on Artisanal Fish Production in a Coastal Area of Nigeria

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Abstract

This study investigated the economic effect of malaria on artisanal fish production in Lagos State, Nigeria. A total of 120 fisher folks households were sampled through a multi-stage random sampling procedure. Primary data which were obtained through administration of structured questionnaire was used for this study. The data were analysed using descriptive statistics, Cost of Illness (COI) approach and ordinary least square (OLS) regression analysis. The study found that 1.67% of the sampled respondent used only mosquito coil as preventive measure while 41.67% of the respondents used a combination of mosquito coil, insecticide and immunization as preventive measures to avert the possible occurrence of malaria among their household members. The mean COI among the fisher folks' households was ₦109, 995.85 per year, out of which 31.6% was spent on drugs and herbs, 15.5% on hospital consultancy fees while the time cost of illness of both the sick person and the caretaker were 28.4% and 13.1%, respectively. The regression analysis result revealed that aged and experienced fisher folks were more susceptible to malaria attack while number of days absent from work, number of malaria episodes and cost of treatment had adverse effect on fish production in the study area. The study concluded that the incidence of malaria in the households impact negatively on fish catch level. It is therefore recommended, among others, that health care services in the fishing communities be improved while fishers should make proper use of preventive measures so as to reduce cost and number of days lost to illness.

Keywords: questionnaire; coping strategy; cost of illness; economic effect; fish production, preventive measures; malaria.

INTRODUCTION

The role of artisanal fish production in poverty reduction and sustenance of livelihoods of many poor households in Nigeria, especially those living in the coastal areas of the country cannot be marginalized. Artisanal fishery is a sector of the fishing industry which involves the use of traditional methods in carrying out fishing activities which are primarily capturing, preservation and distribution of fish and fish products (Pauly, 2006). Generally, artisanal fish farmers usually utilize labour intensive gears for fishing operations (Coates, 2000) and operate as individual or in small groups scattered units often in remote areas, some of which are without modern amenities (Akinola, 2006). One of the greatest problems confronting millions of Nigeria today is lack of adequate protein intake both in quality to feed the nation's ever-growing population. This inadequacy results in problem of malnutrition. The aftermath effect of serious deficiency in the amount of protein intake is that people's health is adversely affected; especially the mental capability, labour productivity and eventually, the overall national economic growth (Okoruwa and Olakanmi, 1999).

Health as a capital good can either improve or reduce household's productive ability and efficiency level. A study of fishing activities (Federal Department of Fisheries (FDF), 1995) found that the vast majority of the fisher folks endured

muscular fatigue, malaria, rheumatic pains and skin disorder forcing them to take some days off from fishing activities (Cole, 2006). Poor health will result in a loss of days worked or in reduced worker capacity, which, when family and hired labour are not perfect substitutes or when there are liquidity constraints, is likely to reduce output (Antle and Pingali, 1994).

As pointed by the World Bank (2007), illness and death from malaria, and other diseases reduce agricultural productivity and efficiency levels especially through the loss of labour, and assets to cope with illness. Whatever affects labour supply will normally affect production. Not much has been done in the area of relating malaria burden to farm productivity in Nigeria; and much more in relation to fish production. Given the importance of fish in the diet of an average Nigerian, emphasis should be placed on researches that aim at understanding the intrinsic relationship between malaria episodes among farm households in relation to productivity. Although artisanal fishers contribute significantly to local fish production in Nigeria, there are a few studies on the effect of malaria on their productivity, particularly in lower Ogun river basin area where we have the largest artisanal fisher folks in the State. The result of this study could be crucial in designing intervention and development program that will improve the health status and productivity of artisanal fisher folks in the study area.

The economic impact of malaria

Economists have attempted to put an economic value on the burden of malaria by measuring the impacts on (a) households, (b) health systems (c) national economies. At the household level, malaria imposes both direct and indirect costs. Direct costs include time lost from work and medical treatment costs (including transportation and medical care). Indirect costs, which are typically harder to measure include loss of work efficiency and time and work reallocation within the household. The indirect costs of malaria are also widely felt as worker productivity lowers with increased sick leave, absenteeism, and premature mortality of the workforce. For many, the transmission period of malaria coincides with the planting and fishing peak season, which further lowers catch and agricultural productivity. The economic impact of malaria has been estimated to cost Africa \$12 billion every year. This includes costs of health care, working days lost due to sickness, days lost in education, decreased productivity, and loss of investment and tourism (Greenwood et al., 2005). In some countries with a heavy malaria burden, the disease may account for as much as 40% of the public health expenditures, 30-50% of inpatients admissions, and up to 50% of outpatient visits (WHO, 1999).

The economic impact of malaria extends beyond the direct impact on labour productivity. A high malaria burden is likely to increase labour turnover, resulting in increased hiring and training costs and reduced profitability for enterprise. Furthermore, a high malaria incidence within a particular area may reduce tourism, deter otherwise foreign and domestic investment, and prevent the use of land or other natural resources (WHO, 2001). Malaria may also limit the movement of workers due to the reluctance of both foreign and domestic labour to move to malaria-infested regions.

Expenditures on malaria

Household expenditures on malaria control consist of two main components: expenditure on malaria (and mosquito nuisance) prevention, and expenditure on treatment. With respect to malaria prevention, measures such as mosquito coils, aerosol sprays, bed-nets, and mosquito repellents are used to very differing degrees in different areas and by different households. Household expenditure on malaria-related treatment includes out-of-pocket expenditure for treatment fees, drugs, transport, and the cost of subsistence at a distant health facility. The medical cost, as well as the treatment-seeking cost and the prevention cost, could be quite high especially among poor households. This could potentially result in lower food consumption and investment in agricultural production by the household. It has been found that in sub-Saharan Africa, households could spend between US\$2.00 and US\$25.00 on malaria treatment and between US\$0.20 and US\$15.00 on prevention each month. In Kenya and Nigeria, treatment costs to small-scale farmers

were estimated to be as high as 5% and 13%, respectively, of total household expenditure (WHO, 1999).

One activity that costs money and takes household time from economic activities is funerals resulting from death from malaria illness. The premature death of a household member can pose significant costs such as transporting the body and the funeral expenses (Asenso-Okyere and Dzator, 1997). Members of the bereaved family and most people in the community and elsewhere miss productive activities for a number of days and attend burial and funeral rites.

It is obvious that even in health-care systems where medical services and treatment are free, malaria still has a significant impact on productivity. The depleted capital stock and lost savings due to expenditure on prevention and treatment of malaria, especially with the introduction of expensive Artemisia-class Combination Therapy (ACT) in Africa, could reduce investment in agriculture by the affected households.

However, the effect of demand has often been left out in the discussions. Malaria reduces labour productivity and also depletes household cash reserves. This reduces the demand for inputs for agricultural production and also the demand by households for other goods and services.

Coping and struggling strategies

Coping strategies can be defined as a set of actions that aim to manage the costs of an event (shock) or process that threatens the welfare of some or all of the household members. Ultimately coping strategies are seeking to sustain the economic viability and sustainability of the household (Sauerborn et al., 1996). Coping strategies are vitally important for poor households faced with illness cost shocks, since the costs associated with serious illness can absorb a large proportion of the household budget and therefore require the mobilisation of substantial additional resources. Even minor illness costs can exceed the low and insecure daily or weekly budgets of the poor, who often survive on a daily wage that is barely enough to meet minimum food requirements (Russell, 2001). Ability to cope with the extra costs of minor illnesses, let alone more serious ones, is therefore essential for the health and livelihoods of poor households. The concept of coping is now being applied to illness costs and the short- or long-term shocks they impose on the household economy (Goudge and Govender, 2000; McIntyre and Thiede, 2003; Russell, 1996; Sauerborn et al., 1996).

Strategies to cope with costs were further divided into strategies to cope with the direct costs of illness which are often adopted in sequence by households to minimise the risks to livelihood sustainability using savings; pawning jewellery; borrowing or making claims from social networks; selling food stores; reducing consumption of non-essentials and then more essential items; diversifying income sources;

selling unproductive assets; reducing Investments (e.g. withdrawing a child from school); selling productive assets such as livestock, land or machinery (McIntyre and Thiede, 2003). Others can be regarded as strategies to cope with the indirect costs of illness, which in most cases, are related to loss of workers (labour supply) in the fishing activities and was referred to as intra-household labour substitution by Sauerborn et al. (1996).

Household ability to cope with illness costs, in terms of their access to strategies and the affordability and sustainability of these strategies (McIntyre and Thiede, 2003), is linked to two key factors. First is household's vulnerability or resilience which is based on household's asset portfolios that include human, physical and financial assets, and intangible social resources (Sauerborn et al., 1996b). Second is the type of illness. The severity and duration of illness will influence the level and duration of illness costs; thus determining the coping strategies that households adopt and their affordability or sustainability over the medium term. A useful framework of four illness categories that necessitate different types of coping has been developed by McIntyre and Thiede (2003). The more serious and longer term the illness the more likely it is that the household will struggle or fail to cope with the costs, becoming impoverished or even failing to survive as a social unit.

Studies that ignore coping strategies can lead to misleading conclusions about the costs of illness (Chima et al., 2003). On the one hand, ignoring the effects of borrowing, cuts to food consumption or asset sales may underestimate the total costs of illness to households. On the other hand, ignoring intra-household labour substitution that mitigates or negates any production or wage losses can lead to overestimation of indirect illness costs. This research work therefore aimed at investigating the coping strategies adopted by the fisher folks to manage the incidence of malaria in their households.

Objectives of the study

Specific objectives of the study were to:

- describe the preventive measures employed by the fisher folks to avert the occurrence of malaria in their households
- estimate the cost expended by the fisher folks as a result of malaria occurrence
- determine the effects of malaria on fish production in the study area
- describe the coping strategy adopted by the respondents in the study area

MATERIALS AND METHODS

Study area, sampling techniques and data collection

This study was conducted in selected fishing communities in Ikorodu and Kosofe Local Government Area of Lagos

State which are the major fishing region in the state. The study areas are located around longitudes 3°22'E/ 3°39'E, and latitudes 6°31'N and 6°39'N. It is bounded to the west by Ikeja, eastern end of Ikorodu Local Government Area to the east, and Akoka/Ikaje-Bariga in Somolu Local Government Area and the Lagos lagoon to the southeast. It also shares boundary with Ogun State in the north. Multistage sampling technique was used to select 120 fisher folks in the study area. The first stage involved purposive selection of two Local Government Areas (Ikorodu and Kosofe) given that they contain the major fishing communities in the state. The second stage involved the use of simple random sampling techniques to select four fishing communities in the two Local Government Areas. The selected fishing communities are Agboyi-Ketu, Odo-Ogun, Ajegunle and Ibese. Thirty respondents were then randomly selected from each community. Primary data used for the study were collected from the household heads with the aid of structured questionnaire and interview schedule.

Data analysis techniques

Descriptive analysis: descriptive statistics such as means, frequencies, and percentages were adopted to describe the preventive methods and coping strategies adopted by the fisher folks.

Cost of illness: The cost expended as a result of malaria incidence was analyzed using the cost of illness procedure adopted by Sauerborn et al. (1996) as follows:

According to Sauerborn et al. (1996):

1. Financial cost of illness

$$F = \sum_{l=0}^N (F_{dt} + F_{fi} + F_{tr} + F_{li}) \quad (1)$$

Where:

F = total financial costs of health (in Naira)

F_{dt} = financial cost of drugs and herbs (in Naira)

F_{fi} = financial cost of medical consultancy (in Naira)

F_{tr} = financial cost of travel (in Naira)

F_{li} = financial cost of subsistence (in Naira)

N = number of illness episodes

2. Time cost of illness:

$$T = \sum [(T_{si} * wsi) + (T_{ei} * wci)] \quad (2)$$

Where:

T = total time costs (days of forgone catch)

T_{si} = time costs of the sick person (days of forgone catch)

T_{ci} = time costs of the caretaker(s) (days of forgone catch)

W_{si} = daily wage rate of the sick person in Naira

W_{ci} = daily wage rate of the caretaker in Naira

3. Economic cost of illness:

$$E = \sum (Fi + Ti) \quad (3)$$

Following Akinbode (2010), a minor addition to this model is the inclusion of prevention cost (Pc) for the purpose of this study. Therefore, the economic cost of illness (COI) to be adopted for this study is

$$E = \sum (Fi + Ti + Pc) \quad (4)$$

Where:

E = Economic cost of illness

F_i = total financial cost of health (in Naira)

T_i = Total time costs (days of forgone catch)

Pc = Prevention cost

Ordinary Least Square (OLS) regression analysis was used to determine the effect of malaria on fish production. The model is specified as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, U) \quad (5)$$

Where,

Y = Fish output (Kg)

X1 = Age of fishers (years)

X2 = Sex (1= Male, 0= female)

X3 = Household size (No of people)

X4 = Educational level (years)

X5 = Fishing experience (years)

X6 = Number of malaria episodes/yr

X7 = No of days lost due to malaria/yr

X8 = Cost of treatment/yr

U = Error term

RESULTS AND DISCUSSION

Malaria preventive methods

Various preventive measures such as the use of mosquito coils, insecticide treated nets; insecticides, prophylactic treatments, and immunization were taken among the sampled households. It was observed that majority of the households used more than one preventive measure to avert the possible occurrence of malaria illness among their household members. Only 1.67% of the households employed the use of one preventive measure (mosquito coil), 41.67% of the respondents used a combination of mosquito coil, insecticides and immunization as preventive measures while 16.67% of the respondents adopted all the listed preventive measures to avert possible illness. This

result is in agreement with Akinbode (2011) who reported that majority of the rice farming households in Ogun State used mosquito coil as their preventive measure against malaria.

Table 1. Distribution of Fisher Folks Household by Preventive Measures

Preventive Methods	Frequency	Percentage
Mosquito coil	2	1.67
Coil, net & prophylactic	20	16.67
All listed methods	20	16.67
Mosquito & net	9	7.5
Coil, insecticide & immunization	50	41.67
Coil, insecticide & prophylactic	7	5.83
Coil & prophylactic	12	10
Total	120	100

Source: Field Survey, 2014

Economic Cost of Illness (COI) in the study areas

The COI approach was used in this study to assess the economic burden of malaria imposed on fisher folks' household within a year. According to CDCP (2008) the COI provides the monetary estimate for the economic burden of disease. Results from the Cost of illness approach showed that the average household COI per year was ₦109,995.85 (US\$687.47) as shown in Table 2. Out of this sum ₦34,795.5 (US\$217.47) (31.6%) was spent on treatment (drugs and herbs) per year, ₦17,100 (US\$106.88) (15.5%) was spent on hospital consultancy fees, ₦1,505.83 (US\$9.41) (1.4%) was the travel cost to the hospital, ₦2,354.18 (US\$14.71) (2.1%) was for subsistence (i.e. cost of feeding while on hospital admission) while ₦8,673.67 (US\$54.21) (about 7.9%) was spent on prevention such as purchase of mosquito coil, insecticides, insecticide treated nets and prophylactic treatments per year. The estimated total cost of illness is almost six times as higher as the amount (₦17, 685.39; US\$110.53) reported by Akinbode (2011) for an average rural rice farming households in Ogun State, Nigeria. The estimated annual costs of treatment and prevention translate to approximately US\$19 and US\$5 on monthly basis, respectively. This is in line with the assertion of Shepard et al. (1991) that households in Sub-Saharan African countries spent between US\$2.00 and US\$25.00 on malaria treatment and between US\$0.20 and US\$15.00 per month on prevention.

The proportion of household's COI attributed to time cost of both the sick person and the caretaker per year were ₦31,237.5 (US\$195.23) and ₦14,439.17 (US\$90.24) representing 28.4% and 13.1% of the households total cost of illness, respectively. This reflects the opportunity cost of time or labour earnings that were forgone as a result of ill health. As such, this reflects labour time that could have been spent fishing.

Table 2. Average cost of illness per year among fisher folks households in the study area for one year

Items	Cost (₦)	Cost (US\$)	Percentage of Total cost
Financial cost of drugs and herbs	34,795.50	217.47	31.6
Financial cost of consultancy	17,100	106.88	15.5
Financial cost of travel	1,505.83	9.41	1.4
Cost of subsistence (Feeding)	2,354.18	14.71	2.1
Time cost of sick person	31,237.50	195.23	28.4
Time cost of caretaker	14,439.19	90.24	13.1
Prevention cost	8,673.67	54.21	7.9
Total cost of illness (COI)	109,995.85	687.47	100

Source: Field Survey, 2014 Note: 1 US\$ = ₦160

Effect of malaria on fish production in the study area

The OLS regression analysis was used to determine the socio-economic factors contributing to the fisher folks' susceptibility to malaria and the effect of malaria on fish production in the study area. Results from the analysis showed that age ($p < 0.01$) and experience ($p < 0.05$) of the fisher folks were the significant socio-economic factors contributing to the fisher folks' vulnerability to malaria attack in the study area. This implies that the older and more experienced fisher folks in the study area were more susceptible to malaria attack, which could be due to the fact that the body's immune system becomes weak with age. The result from the analysis also revealed that the number of days absent had a negative significant relationship with fish production ($p < 0.1$). That is the length of days that the fisher folks suffering from malaria were economically inactive and could not go out for fishing. The negative coefficient of the variable implies that the fisher folk would experience income loss for the period absent from fishing. This is in agreement with Achoja (2011) who reported a possibility of monthly income short fall for the fishers due to loss of income that would have been earned during the period of incapacitation. Number of malaria episodes and cost of malaria treatment also had negative significant relationship with fish production in the study area. This implies that increasing number of malaria episodes which subsequently increase the cost incurred in the treatment of malaria will have adverse effect on fisher folks as it translates to more income loss to the fisher folks.

The coefficient of determination R^2 value was 79%. This implies that 79% variation in fish production was explained by the joint effects of malaria related factors. The F-statistic of 32.87 was significant at 1% level of significance, meaning that all the explanatory variables put together explained the variability of fish production in the study area.

Table 3. Result of the regression analysis

Variables	Coefficients	T-statistics
Constant	7843.17	2.86
Age of fisher folks	658.98	6.37*
Sex	-58.76	-0.15
Household size	-11.42	-0.28
Education	109.28	0.33
Fishing Experience	227.91	2.17**
No of malaria episodes	-348.47	1.74***
No of days absent	-317.09	1.88***
Cost of treatment	-218.28	1.96***
R	0.79	
F-value		32.87*

*, **, *** Significant at 1%, 5% and 10% level of significance
Source: Field Survey, 2014

Coping strategies adopted by respondents in the study areas

The respondents employed various coping strategies to cope with the adverse effect of illness episodes in their households. Table 3 shows that 24.2% of the households coped by hiring labour, 39.2% of the households spent part of their savings during illness. They thus preferred to delay fishing activities until they felt better because of distrust of labourers whom they could have hired as alternative coping strategy. Approximately 26.7% of the respondents preferred to borrow money from their intending customers with a promise to sell their fish to them after recuperating. Russell (2003), McIntyre and Thiede (2003), and Chima and Goodman (2003), reported that households in Sri Lanka, Bangladesh and Harare in Zimbabwe coped by hiring labour, borrowing and spending part of their savings during illness episodes. This is further corroborated by Akinbode (2011), who opined that hired labour was the most adopted coping strategy among rice farming households in Ogun State while labour substitution from the extended family members was the common coping strategy in Niger State.

Table 4. Major coping strategies adopted by fisher folks households during illness

Coping Strategy	Frequency	Percentage
Hiring labour	29	24.17
Falling back on savings	47	39.17
Borrowing	32	26.67
Hiring and savings	5	4.17
Savings and borrowing	7	5.83
Total	120	100

Source: Field Survey, 2014

CONCLUSION

Findings from the study revealed that majority of the sampled fisher folks employed more than one preventive

measure to avert the possible occurrence of malaria in their households. Results from the Cost of illness approach showed that the average household COI per year was ₦109,995.85 (US\$687.47), out of which ₦31,237.5 (US\$195.23) and ₦14,439.17 (US\$90.24) were time cost of both the sick person and the caretaker per year. The OLS regression analysis which was used to determine the socio-economic factors contributing to the fisher folks' susceptibility to malaria and the effect of malaria on fish production in the study area revealed that age ($p < 0.01$) and experience ($p < 0.05$) of the fisher folks were the significant socio-economic factors contributing to the fisher folks' vulnerability to malaria attack in the study area while number of days absent ($p < 0.1$), number of malaria episodes ($p < 0.1$) and cost of malaria treatment ($p < 0.1$) had a negative significant relationship with fish production in the study area. The coping strategies adopted by the fisher folks to cope with the adverse effect of illness episodes in their household as revealed by the study were hiring labour, falling back on savings and borrowing from their customers.

Fisher folks' households in the study area incurred substantial cost of illness and numerous valuable work days were lost due to illness occasioned by malaria. The incidence of malaria in the households impacts negatively on productivity due to a stoppage in fishing activities during illnesses. Provisions of a non-conducive environment for malaria among others will likely boost fish catch in the study areas.

Based on the findings of this study, it is recommended that to curb the menace of ill-health occasioned by malaria, health care services should be improved in the fishing communities in order to facilitate good medical care to the fisher folks' households. Furthermore, this medical care should be subsidized to reduce the economic burden of malaria on members of the fisher folks' households. Also health education should form a core of educational or extension service delivery to the fisher folks to assist them make proper use of preventive measures so as to reduce cost of treatment and number of days lost to illness.

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