WILLINGNESS TO PAY FOR MALARIA INSURANCE: A CASE STUDY OF HOUSEHOLDS IN GHANA USING THE CONTINGENT VALUATION METHOD

John Asafu-Adjaye and Janet Dzator
School of Economics
Faculty of Business, Economics, and Law
The University of Queensland
Brisbane, Qld 4072, Australia

This paper reports the results of a study which estimated household willingness to participate in a malaria insurance scheme in Ghana using the contingent valuation method. The study was conducted in two communities representing rural and urban areas of the country. The results indicate a high level of support for the scheme, reflecting the social and economic importance of the disease. The level of premium that households were willing to pay was significantly influenced by income, years of formal education, occupation type and number of children in the household. The results show that an insurance programme which encourages 'pre-saving' towards treatment fees could curtail self-medication and household decisions to delay seeking care, thereby promoting early and efficacious treatment of malaria.

1. INTRODUCTION

Malaria is a major health and development problem facing many developing countries today. The disease is endemic in 91 countries and affects about 40 per cent of the world's population. Sub-Saharan Africa (SSA) is the most affected region where it is estimated that between 0.5 and 2 million people die annually from the disease (Snow *et al.*, 1999). Malaria is caused by a protozoan parasite belonging to the genus *Plasmodium* and is transmitted though the bites of mosquitoes (*Anopheles gambiae*). Efforts to control the disease have included targeting of mosquito populations, minimizing the number of infective bites for a given mosquito population, developing antimalarial drugs, and an effective vaccine. Large scale spraying of Dichlorodiphenyltrichloroethane (DDT) after World War II resulted in a substantial reduction in mosquito populations and malaria morbidity in the Mediterranean region and parts of Asia, but no large-scale control measures were undertaken in SSA.

Table 1 reports figures for GNP per capita and malaria mortality rates for various regions. As indicated earlier, SSA has the highest mortality rates with South East Asia coming a distant second.[1] The figures indicate a strong negative

[1] The distribution and transmission of malaria are affected by a number of environmental factors including temperature and rainfall. The *Anopheles gambiae* complex, the major vector system in Africa, exists only in frost free regions (Gilles and Mcillion, 1968) or where the minimum winter temperature exceeds 5°C (Leeson, 1931).

correlation between per capita income and malaria mortality rates. Two reasons may be given to explain this link. First, income increases provide households with the means to invest in antimalaria protection such as bednets, sprays, and prophylactics. Second, the government's capacity to provide health care and malaria eradication increases with per capita income.

TABLE 1

MALARIA MORTALITY IN 1995

Categories	GNP per Capita (1996, US$)	Mortality ('000s)	Mortality Age 0-4	Cases ('000s)
High income countries	25870	0	–	–
Low income countries	490	1110	–	–
Africa	490[a]	961	745	237647
Americas	3710[b]	4	0	2043
Eastern Mediterranean	n.a.	53	36	13693
Europe	2200[c]	0	0	0
South East Asia	n.a.	73	10	15791
Western Pacific	n.a.	20	2	3751

Notes:
a. Includes China and India
b. Excludes U.S.
c. Includes Central Asia
Sources: GNP per capita – World Bank (1998); Mortality – WHO (1999).

Traditionally, health care financing has been a prime responsibility of governments. However, in developing countries, dependence on the government as the main source of finance has resulted in a deterioration of service quality and infrastructure. In SSA, the problem has been exacerbated by declining real levels of health funding due to poor economic performance and mounting debt. In the last two decades, many of these countries have undertaken economic reforms under the auspices of the World Bank and the International Monetary Fund. These reforms, commonly referred to as Stabilisation and Structural Adjustment Programs, have included the introduction of user fees in the health sector. Available evidence (e.g. see Bethone *et al.*, 1989; Waddington and Enyimayew, 1989) indicates that the policy has led to a significant decline in the utilisation of orthodox health care facilities.

This paper investigates household willingness to pay (WTP) to participate in a malaria insurance program in Ghana using the contingent valuation method (CVM). A disease specific scheme such as malaria is chosen because it is a common disease accounting for about 40 per cent of outpatient visits and 9 per cent of admitted cases in Ghana (Ministry of Health, 1991). Furthermore, the use of a specific disease in the valuation exercise should improve the quality of the data in terms of households' ability to value the benefits of a health insurance scheme. The Ghana government is currently contemplating the introduction of a national health insurance (NHI) scheme to mitigate the effects of upfront user charges. The results of this study will have implications for the viability of such a scheme as a vehicle for promoting early and efficacious malaria treatment behaviour.

The remainder of the paper is organized as follows. Section 2 discusses the research design including the sample and survey methodology. Here, we also present theoretical and empirical models of households' willingness to contribute to a malaria insurance scheme. Section 3 discusses the results while Section 4 concludes.

2. RESEARCH DESIGN

2.1 The Sample

Data for the study were obtained in face-to-face household interviews conducted in Ghana between July and November 1997. Two communities, Amasaman in the Greater Accra region and Hohoe in the Volta region, were selected for the study. Amasaman has a population of about 80,000 while Hohoe has a population of about 143,670. The main source of economic activity in both areas is agriculture, with a few people engaged in some cottage industries and roadside hawking. The sampling frame consisted of all households in the two selected communities. Two groups or cohorts of households, labelled as 'household level' and 'facility level' samples were selected in each of the two communities.[2] The Volta and the Greater Accra regions of Ghana were selected in order to compare malaria care demand in two contrasting regions. The Greater Accra region is predominantly urban and has relatively low levels of poverty (Boateng *et al.*, 1992) while the Volta region is mainly rural and has higher levels of poverty. Since the household survey was to be conducted in only one community in each district, it was necessary to select a community with a relatively large population in order to yield a reasonable sample size. Convenience sampling was therefore adopted in the selection of the two study communities while cluster sampling was employed to select the household level sample.[3]

The 'facility level' sample comprised respondents who have had their malaria status confirmed at health facilities and were selected by convenience sampling. There are two reasons for selecting such a sample. First, in self-reported malaria cases, there is always the problem of people reporting other fevers which mimic the symptoms of malaria. Second, the facility level sample allows us to compare behaviour with the household level sample regarding willingness to join a prepayment user fee scheme as well as the amount of money that they would be willing to pay.

In total, 228 households were sampled in the two communities for the household level sample. However, after adjusting for incomplete information the

2 The 'household level' sample refers to those respondents who were selected through random sampling of houses in the communities while the 'facility level' sample refers to respondents selected at the exits of hospitals and clinics in the communities.

3 For purposes of the study, a household was defined as a number of people who live under the same "roof" and partake of communally prepared food for a period of three months preceding the interview.

final sample size was 182 households. A total of 223 malaria cases and/or households were selected for the facility level sample. However, the usable sample size for the facility level sample was 198. Table 2 provides a detailed breakdown of the sample sizes.

TABLE 2

BREAKDOWN OF SAMPLE SIZES

	Amasaman Area	Hohoe Area	Combined Areas
Household level sample:			
Number of households selected	125	103	228 (182)
Number of malaria cases	112	119	231
Number of households willing to participate in a malaria care insurance scheme	105 (103)	81 (78)	186 (182)
Facility level sample:			
Number of households selected and/or malaria cases	117 (108)	106 (90)	223 (198)
Number of households willing to participate in a malaria care insurance scheme	114 (111)	99 (98)	213 (209)

Note: Figures in parentheses indicate the usable sample sizes.

2.2 The Contingent Valuation Method

Contingent valuation is a survey method mainly used to place monetary values on goods and services for which market prices do not exist. Respondents to such a survey are presented with a realistic but hypothetical scenario and asked questions about how much they are willing to pay for an improvement from the status quo, or the minimum amount of compensation they would be willing to accept for a deterioration from the status quo. In recent years, there has been a dramatic increase in the application of the CVM to a wide range of goods as well as in many areas of applied economics.[4] In the area of health economics, the CVM has been used in several applications to investigate WTP for health improvements or risk reductions due to disease and pollution (e.g. see Clay, 1999; Kartman *et al.*, 1996, and Johannesson *et al.*, 1993). The applications of the CVM in developing countries include WTP for wildlife viewing in Kenya (Navrud and Mungatana, 1994), willingness to pay for water in Nigeria (Whittington *et al.*, 1991), willingness to contribute labour and money towards the control of tsetse flies in Kenya (Echessah *et al.*, 1997) and Ethiopia (Swallow and Woudyalew, 1994), and willingness to contribute to a national insurance scheme in Ghana (Assenso-Okyere *et al.*, 1997).

4. Wilson (1998) reports over 2,500 studies that have used the CVM.

The precoded questionnaires for this study were prepared in English but the interviews were conducted in the two local dialects, *Ewe* and *Twi*. The questionnaires were fine tuned after extensive pretesting. The interviewers were trained for several days by instructors well versed in the two local dialects. The bidding game approach was used to elicit respondents' WTP for malaria insurance.[5] In view of the fact that information given in the hypothetical scenario is crucial for the validity of CVM results (Mitchell and Carson, 1989), the respondents were presented with summarised factual information on the malaria insurance scheme in the form of user fees to be paid in advance of the time of need.

In order to establish the property rights of the scheme, the respondents were informed of the benefits by way of the elimination of delays in seeking health care due to financial difficulties at the time of need. They were made aware of the possibility that some registered members may not contract malaria, for example, in the month in which they are covered by the insurance. The need for continuous monthly payments of the premium in order to be continually covered was stressed. To explain the concept of insurance, parallels were drawn between a popular thrift organisation in Ghana known as *susu* and the proposed NHI scheme.

Reference was made to the fact that in any health insurance scheme, there was the possibility that some people might over-utilise health care services. As a result, the administrators of the scheme might implement measures such as co-payment or apply a deductible policy. The effects of co-payment and deductibles on their expected benefits were also explained. Thus, respondents were informed of the dangers of moral hazard and measures to minimise such dangers. Respondents were also reminded of their budget constraints by being informed that the amount of money they might be willing to pay would not be available for use on other goods.

After being given the background information, the respondents were then presented with the WTP question. Specifically, they were asked whether they would be willing to participate in a malaria insurance programme by paying a monthly subscription or premium of ¢1,000 (US$0.45) [starting point for the household level sample] or ¢5,000 (US$2.28) [starting point for the facility level sample]. The premiums were raised (or lowered) by ¢1,000 increments until an offer was declined. The final section of the interview requested information on socio-economic characteristics such as household income, family size, age, education, gender, and marital status of respondent.[6]

2.3 Theoretical Model

A household's decision to contribute to the malaria insurance scheme can be likened to an *ex ante* valuation of a policy or project that leads to a change in access conditions for clinical care (Johansson, 1987). In other words, the household's willingness to participate in the scheme can be viewed as a choice between two

5 Unlike open-ended questions, the bidding game format requires a simple "yes" or "no" response and is considered to minimize bias (Arrow *et al.*, 1993).

6 A copy of the questionnaire is available from the authors upon request.

uncertain options, namely, up-front user fees which is the *status quo*, and pre-payment of premiums. The selection of one or the other of these options will depend on the household's disposable income which is considered to be a random variable in this case. The choice set is therefore assumed to be characterised by a probability distribution and households are expected to choose the alternative which maximises their expected utility. Thus, it is assumed that households' attitude towards risk is characterised by a von Neumann-Morgenstern utility function. Suppose that households derive utility from malaria treatment (consumption of health care) and a composite good which is considered as a *numeraire* good. The household's indirect utility function can be written as

$$V(Y, M^i) \tag{1}$$

where Y is household disposable income and is assumed to be state-independent and M^i is the malaria treatment option in state in i. The subscript i represents two states of the world – with and without insurance. The probability that state i will occur is denoted as P^i. The utility difference of the two states of the world may be written as

$$\Delta V = \sum_i P_1^i V(Y, M^i) + e_1 - \sum_i P_0^i V(Y, M^i) + e_0 \tag{2}$$

where P_1^i = probability of electing to have malaria treatment under insurance coverage; P_0^i = probability of having malaria treatment without insurance; and e_i= an identically and independently distributed random variable that has an expected value of zero. A household will agree to pay a premium of ¢OP if

$$\sum_i P_1^i V(Y - OP, M^i) + e_1 \geq \sum_i P_0^i V(Y - OP, M^i) + e_0 \tag{3}$$

That is, a household would be willing to pay a premium of ¢OP if utility with treatment under insurance coverage is expected to be at least as high as utility of treatment without insurance. Johannesson *et al.* (1993) have shown that a linear approximation of $V(Y - OP, M^i)$ around $V(Y, M^i)$ yields

$$V(Y - OP, M^i) = V(Y, M^i) - \lambda OP \text{ for all } i \tag{4}$$

where λ is the marginal utility of income in state i. Substituting (4) into (3) and rearranging gives

$$\sum_i \Delta P^i V(Y, M^i) - \Delta OP + e_i \geq e_0 \tag{5}$$

where ΔP^i represents a change in the two probabilities and λ_E is the expected marginal utility of income. From (5) the state-independent WTP for the premium given that a household would pay ¢OP, can be specified as

$$OP = \left[\sum_i \Delta P^i V(Y, M^i)/\lambda_E\right] - \frac{\varepsilon}{\lambda_E} \qquad (6)$$

where ε is the difference between the error terms and $E(\varepsilon) = 0$. The expected value of the access price is then given as

$$E(OP) = \left[\sum_i \Delta P^i V(Y, M^i)/\lambda_E\right] \qquad (7)$$

2.4 Factors affecting WTP for a Malaria Insurance Premium

It is hypothesised that the following factors influence a household's WTP for a malaria insurance premium: characteristics of the household head/decision maker – age, gender, educational level, marital status, and primary occupation; and characteristics of the household – income and household size (number of adults and children). Other relevant factors include location of community and migration status. Children are highly vulnerable to malaria and require frequent medical attention. It is therefore hypothesised that the greater the number of children, the more likely households are to contribute to the malaria insurance scheme. The effect of number of adults on a household's WTP cannot be determined *a priori*. Some households with large numbers of adults may not be willing to join the insurance scheme because the adults may have developed immunity to the disease and therefore suffer less frequently from it. It is important to stress that willingness to participate in the scheme could be affected by adverse selection. Adverse selection in this case refers to the situation where only people who are at greater risk (e.g., households with larger numbers of children) would elect to participate in the malaria insurance scheme. Married respondents are more likely to pay higher premiums due to the likelihood of there being a combined income.

Migrants in many communities in developing countries face additional challenges compared to their indigenous counterparts. Most indigenous residents for example, do not pay rent for accommodation since they live in owner-occupied homes and also have assets such as land which they lease to migrants. Tenancy agreements could be harsh on the income of migrants. These and other factors impacting on migrant incomes are therefore likely to reduce the level of premium that they are willing to pay. It is not possible to determine *a priori* the effects of other variables such as location and occupation.

A reduced form model for WTP for a malaria insurance premium can be specified as

$$WTP = f(INC, NAD, NCH, GEN, AGE, YSC, MAR, LOC, OCC, MIG) \qquad (8)$$

where INC = household money income;[7] NAD = number of adults in a household; NCH = number of children in a household; GEN = gender of respondent (i.e., household head or decision maker); AGE = age of respondent; YSC = number of

[7] Due to the fact that income tends to be underreported in surveys, household income was proxied by total household expenditure.

years of formal education received by respondent; MAR = marital status of respondent; LOC = community in which respondent and his or her household are located; OCC = primary occupation of the respondent;[8] and MIG = migration status of the respondent and hence the household.

2.5 Specification of the Malaria Premium Choice Model

Although the response to the valuation question is discrete, the observed values are implicitly ordered. For example, those accepting ¢2,000 as their maximum premium may actually be willing to pay a higher amount not exceeding ¢3000. That is, although a response may not necessarily be the maximum premium, the "true" WTP may lie in the interval between the maximum value that the respondent is willing to pay and the next highest value (Maddala, 1983; Greene, 1997). The implication of such a problem is that although the outcome of the event is discrete, the multinomial logit or probit model would fail to account for the ordinal nature of the response variable. Therefore, in this case, a more appropriate estimation model would be the ordered probit (or logit) model. The ordered probit model is specified as follows,

$$Y_i^* = \beta_i' X_i + \varepsilon_i \quad (i = 1, 2, ..., n) \tag{9}$$

where $\varepsilon i \sim N[0,1]$

$Y_i = 0$ if $Y^*_i \leq \mu 0$

1 if $\mu 0 < Y^*_i \leq \mu 1$

2 if $\mu 1 < Y_i^* \leq \mu 2$

...

J if $Y^*_i > \mu$ (J-1)

where Y^*_i = the respondent's "true" but unobserved WTP values and Y_i is the observed counterpart

X_i = a vector of explanatory variables

β = a vector of parameter coefficients

ε_i = the error term, and

μ_i = the observed counterpart of ε_i

The WTP values or premia obtained from the survey were used as the dependent variable in the above regression. Although Y^*_i is unobserved, we can determine the exact category (i.e. the m^{th} category) of premium (*OP*) it belongs to because each respondent in the sample indicated the amount his or her household would be willing to pay as malaria insurance premium. Maddala (1983) has shown that a set of constants, α_i, defined as $\alpha_i = -\infty$, $\alpha_m = \infty$, where $\alpha_i < \alpha_2 < ... < \alpha_m$, can be used to assign Y to the different categories of the m ordered choice sets available to respondents. For example, Y belongs to j^{th} category of premium if

[8] Primary occupation is defined here as the main economic activity that the respondent relies on for his/her income.

$$\alpha_{j-1} < Y_i^* < \alpha_j \;\; (j = 1, 2, ..., m) \qquad (10)$$

The chances that each household in the sample would be willing to pay a particular premium for malaria insurance could be determined by assuming that the choice probabilities are dependent on individual and household characteristics (X). Assuming that X can be equated to some ordinal value Q, let Q be defined as

$$Q_{ij} = 1 \text{ if } Y_i \text{ belongs to the } j\text{th category}$$
$$Q_{ij} = 0 \text{ if otherwise } (i=1,2,...,n; j=1,2,...,m) \qquad (11)$$

Using the ordinal value in (10), the choice probability that characterises the observed household behaviour can be specified as

$$\Pr(Q_{ij} = 1) = \Phi(\alpha_j - \beta' X_i) - \Phi(\alpha_{j-1} - \beta' X_i) \qquad (12)$$

where $\Phi(\cdot)$ is the cumulative standard normal (Maddala, 1983). We used the maximum likelihood estimation approach to estimate the likelihood function derived from this probability model.

Marginal effects

To assess the importance of the findings for decision making, it is necessary to know the marginal effects or the impact on the premia that respondents are likely to pay due to changes in the independent variables. The marginal effects were obtained by including a code in the command module of the LIMDEP program (Greene, 1998) for the ordered probit model. Mathematically, the marginal effects can be estimated using the effects of changes in the covariates on the cell probabilities. This is because ordered probit models do not generate any meaningful conditional mean functions to manipulate (Greene, 1998). The equation for the marginal effects is specified as

$$\partial \Pr(\text{cell } j) / \partial X_i = \{f(\mu(j-1) - \beta' X_i - (\mu(j) - \beta' X_i]\} \times \beta \qquad (13)$$

where $f(\cdot)$ is the standard normal density function and each vector, X, is a multiple of the coefficient vector. The interpretation of the coefficient estimates requires care because the partial effects can have signs that are opposite to those of the estimated coefficients.

3. EMPIRICAL RESULTS

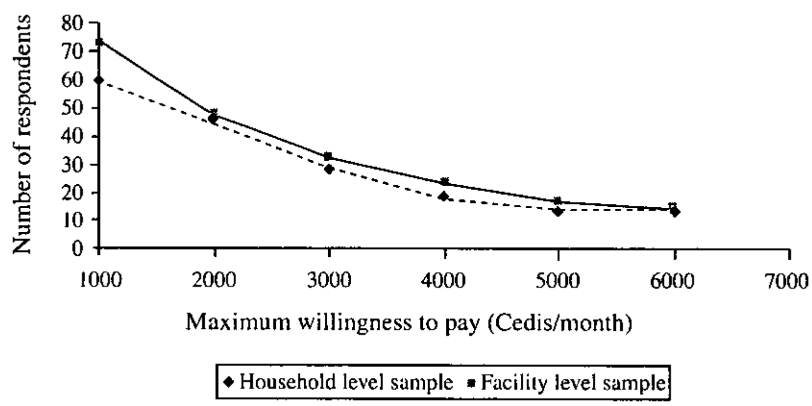
3.1 Household Willingness to Participate in the Malaria Insurance Scheme

Figure 1 shows the number of respondents willing to make different levels of monetary contributions to the malaria insurance scheme.

The results indicate general enthusiasm for the scheme. One hundred and eighty-two households in the household level sample (97.8 per cent) and 209 households in the facility level samples (98.0 per cent) were willing to pay amounts ranging from ¢1,000 to ¢5,000 or more per month to participate in the scheme. About 2 per cent of households in both samples expressed their desire to join the malaria insurance scheme but were unable to specify the level of premium they

FIGURE 1

HOUSEHOLD WILLINGNESS TO PAY FOR A MALARIA INSURANCE PREMIUM



Note: The last category represents bids of more than 5000 Cedis per month.

were willing to pay. As expected, there is a negative relationship between demand for malaria insurance and the size of the premium. At nearly all bid levels, WTP for the facility level sample is relatively higher than for the household level sample. This issue is discussed later.

Table 3 presents the mean facility price and the lump sum treatment cost per episode of malaria as well as the mean and median amounts that households are willing to pay as premium. Facility price refers to the total amount of money paid at a facility in the form of fees while seeking care. It includes charges for services as well as payment for drugs. The lump sum treatment cost on the other hand is the sum of facility price and any other direct payments toward the treatment of the identified malaria case. The lump sum treatment cost therefore includes payments for transportation and prescriptions purchased outside health facilities. For both the household and facility level samples, the highest expenditures were incurred at private health facilities.

Depending on the question format used to elicit WTP values, different types of procedures can be used to calculate the mean WTP. For surveys using the bidding game format, Johansson (1987) argues that the traditional aggregation method is the most appropriate procedure if there is no starting point bias. Although two different starting bids were used, the proportion of "yes" answers to the different categories of bids suggested to respondents in this study seems to be consistent (Figure 1). It was therefore concluded that starting point bias is not a serious problem. As such, the aggregation procedure was used to calculate the mean willingness to pay. Specifically, the mean WTP values for the two cohorts were obtained using the relation

$$\overline{WTP} = \sum_{j=1}^{6} \pi_j X_j \tag{14}$$

where $\overline{WTP}$ = mean willingness to pay; π_j = proportion of respondents accepting to pay the j^{th} category bid; and X_j = the j^{th} category bid.

Mean premia calculated using (14) were ¢2,566.70 per month for the household level sample and ¢2,607.66 per month for the facility level sample. The mean monthly premium for the household level sample was comparable to the reported prices in Table 3 for self-medication (¢1,917.97) and drug store purchases (¢3,506.34). The median WTP for the two cohorts was ¢2,000.00.

TABLE 3

MEAN AND MEDIAN WILLINGNESS TO PAY AND THE COST OF CARE PER EPISODE OF MALARIA AT DIFFERENT FACILITIES

Treatment option	Facility price (¢)			Treatment cost (lumpsum) (¢)		
	Number	Mean	Standard deviation	Number	Mean	Standard deviation
	HOUSEHOLD LEVEL SAMPLE			FACILITY LEVEL SAMPLE		
Government facility	25 (13.4)	8,046.15	5,148.54	50 (23.6)	12,290.32	12,666.92
Private facility	33 (17.7)	21,863.89	27,637.26	22 (10.1)	24,932.56	27,052.64
Drug store	66 (35.5)	3,506.34	3,927.30	67 (31.5)	3,464.58	3,921.78
Self-medication	62 (33.3)	1,917.97	3,666.28	74 (34.8)	2,423.48	5,458.86
Combined sample	186 (100.0)	6,511.90	13,917.65	213 (100.0)	8,227.75	15,591.09
Mean premium WTP	186 (100.0)	2,560.44		213 (100.0)	2,607.66	
Median premium WTP	186 (100.0)	2,000.00		213 (100.0)	2,000.00	

Note: Figures in parenthesis are percentages.

[9] The model was corrected for heteroscedasticity (Greene, 1998).

TABLE 4

ORDERED PROBIT ANALYSIS OF FACTORS AFFECTING WILLINGNESS TO PAY FOR MALARIA INSURANCE

	HOUSEHOLD LEVEL SAMPLE		FACILITY LEVEL SAMPLE	
Variable name	Estimated coefficient	Mean	Estimated coefficient	Mean
$INTERCEPT_1$	0.56 (6.48)	–	0.97 (8.28)	–
$INTERCEPT_2$	0.93 (8.88)	–	1.44 (10.81)	–
$INTERCEPT_3$	1.23 (10.05)	–	1.71 (11.64)	–
$INTERCEPT_4$	1.92 (11.49)	–	2.31 (12.46)	–
$INTERCEPT_5$	0.32 (0.61)	–	-0.32 (0.50)	–
INC	0.09*** (3.41)	3.57	0.06* (1.88)	3.84
NAD	-0.06 (1.03)	2.82	-0.04 (0.56)	3.38
NCH	-0.01 (0.21)	2.44	0.21*** (3.30)	3.07
GEN	0.03 (0.18)	0.54	0.37 (1.50)	0.26
AGE	0.01 (0.65)	38.27	-0.02* (1.85)	33.46
YSC	0.04*** (2.01)	10.53	0.00 (0.10)	8.62
MAR	-0.14 (0.65)	0.62	-0.13 (0.52)	0.79
LOC	-0.24 (1.56)	0.61	0.59*** (2.73)	0.55
OCC	-0.62* (1.71)	0.92	-0.99* (1.64)	0.95
MIG	-0.06 (0.29)	0.25	-0.09 (0.35)	0.13
Number of observations	186	213		
Log likelihood function	-267.17	-265.62		
X^2	25.29	38.61		
p-value	0.004	0.000		

Notes: Figures in parenthesis are t-statistics.
*** significant at a = 0.001; ** significant at a = 0.05; * significant at a = 0.01

3.2 Results for the Ordered Probit Model

Table 4 presents the results for the ordered probit regression.[9]

For the household level sample, income, level of education attained by the household head, and the occupation of the household head significantly affect the premium levels that households are willing to pay. Income and the number of years spent on formal education by household heads are significant at the 1 per cent level and the primary occupation of the household head is significant at the 10 per cent level. Primary occupation is not highly significant because most respondents rely on other activities to supplement their income.

The factors that significantly affect premium levels among the facility level sample are income, number of children in the household, location, age and primary occupation of household heads. Number of children per household and location of residence of the household (whether in Amasaman or Hohoe) are highly significant at the 1 per cent level (Table 4). The number of years of schooling has a statistically significant (at the 1 per cent level) effect on WTP premium among the household level sample but not for the facility level sample. The descriptive statistics show that respondents or household heads in the household level sample have a relatively higher mean for years of formal education (9.53 years) compared to their counterparts in the facility sample (8.64) and this may, in part, explain the difference in the importance of education between the two groups and hence understanding and appreciating the importance of the insurance scheme. That is, the higher educational attainment by the facility sample allows the respondents to have a better understanding and appreciation of the importance of the insurance scheme. The remaining three significant factors namely income, age and primary occupation are

TABLE 5

PREDICTED PROBABILITIES AND ESTIMATED MARGINAL EFFECTS OF STATISTICALLY SIGNIFICANT VARIABLES IN THE ORDERED PROBIT MODEL

		Probability of paying (¢OP) as premium					
Variable		¢1000	¢2000	¢3000	¢4000	¢5000	¢5000+
				HOUSEHOLD LEVEL SAMPLE			
INC	-0.0346	-0.0005	0.0051	0.0062	0.0140	0.0099	
YSC	-0.0140	-0.0002	0.0021	0.0025	0.0057	0.0040	
OCC	0.2347	0.0036	-0.0349	-0.0419	-0.0946	-0.0668	
Predicted probability	0.3390	0.2580	0.1540	0.1050	0.0760	0.0680	
				FACILITY LEVEL SAMPLE			
INC	-0.0170	-0.0076	0.0036	0.0037	0.0086	0.0088	
NCH	-0.0574	-0.0258	0.0121	0.0125	0.0291	0.0296	
AGE	0.0051	0.0023	-0.0011	-0.0011	-0.0026	-0.0026	
LOC	-0.1623	-0.0731	0.0342	0.0352	0.0823	0.0837	
OCC	-0.2703	-0.1217	0.0569	0.0587	0.1369	0.1394	
Predicted probability	0.3420	0.2390	0.1540	0.1130	0.0800	0.0720	

significant at the 10 per cent level for the facility sample.

Predicted probabilities and estimated marginal effects of the significant variables in the probit model are shown in Table 5.

It is important to note that the marginal effect for a given variable in Table 5 sums to zero, with negative signs showing the WTP categories where the probabilities fall and the positive signs showing the WTP categories where the probabilities rise. The marginal effects therefore show the relative magnitudes of the changes in probabilities for a one-unit change in any particular explanatory variable.

The results indicate that income is an important factor in malaria care consumption decisions. The change in sign from negative (at a ¢1,000 premium) to positive (at a ¢3,000 premium) indicates that there is a higher probability that households would be willing to pay higher premiums as their money income increases. The results in Table 5 indicate a stronger responsiveness among the household level sample than the facility level sample. For example, for a household in the household level sample, a one unit increase in income will increase the probability of its willingness to pay ¢5,000 as a monthly premium by 0.014 compared to 0.009 for a household in the facility level sample. The household level sample has a lower mean income than the facility level sample and therefore a greater WTP probability for a one unit change in income.

In order to calculate the corresponding percentage change in the probability of the household having a WTP of ¢5,000, the predicted probability of having this WTP before the income change is required. From Table 5, the predicted probability of the household having a WTP of ¢5,000 in the household level sample is 0.076. Thus, a 100 per cent increase in income results in 19.4 per cent (i.e. 0.014/0.072) increase in the probability of the WTP being ¢5,000 for the household level sample. The change in the sign on the coefficients from negative to positive suggests that households who visit health facilities are marginally wealthier than other households in the communities.

The direction of the signs on the estimated marginal effects of education indicate that education has a positive effect on household WTP. A one-unit increase in education will increase the probability of a household's willingness to pay ¢5,000 as a monthly premium by 0.0057 in the household level sample. Given that the mean years of formal education of respondents in the household level sample is about 11 years, a one-unit increase in education implies that many respondents and/or decision-makers would acquire second cycle and/or some tertiary level education.

Regarding primary occupation, households heads who are farmers would be more willing to pay lower premiums (¢1,000 and ¢2,000). This finding is consistent with the findings on the effects of income and education. Evidence from the Ghana Living Standard Measurement Surveys indicates that farmer-households generally have lower years of formal education and relatively lower per capita incomes (Boateng *et al.*, 1992). For the facility level sample, the monthly premium is positively related to the number of children in a household. Intuitively, it is expected that households with children would have relatively larger budgets for treatment given that children are more vulnerable to malaria and therefore require more frequent treatment compared to adults.

The results for the facility level sample indicate that increase in age tends to decrease the probability that a respondent will pay a higher premium. For example, older respondents are less willing to pay ¢3,000 or more as premiums. For the facility level sample, Amasaman residents are more willing to pay higher premia (¢3,000 or more) compared to Hohoe residents (¢1,000 and ¢2,000). This difference can be explained by the fact that the Amasaman residents are closer to health facilities and thus have a greater opportunity of using health insurance compared to their Hohoe counterparts.

Our results are broadly comparable to those of Asenso-Okyere *et al.* (1997) who also investigated household willingness to pay a premium to join a national health insurance scheme in Ghana. The main difference between that study and ours is that we included both urban and rural households and focused on a specific disease – malaria. In the Asenso-Okyere *et al.* (1997) study, 98.7 per cent of respondents were willing to pay the minimum bid level of ¢1,000 and 10 per cent were willing to pay the highest bid level of ¢5,000 or more. The median premium was ¢2,000. the significant variables affecting premium levels were gender, education, income households paying a premium of ¢3,000 or more.

4. CONCLUSIONS AND POLICY IMPLICATIONS

This paper has investigated household willingness to participate in a malaria insurance scheme. The study was conducted in two communities representing rural and urban areas of Ghana. The samples were drawn from households and respondents who had their malaria status confirmed at health facilities (facility level sample). The contingent valuation method utilizing a bidding game format was used to elicit the premium levels that households are willing to pay and an ordered probit model was used to analyse factors affecting the premium levels.

The results indicate a high level of support for the scheme, reflecting the social and economic importance of malaria in Ghana. The majority of households were willing to pay a monthly premium of approximately ¢2,500 (the mean premium for household level sample was ¢2,566.70 while that for facility level sample was ¢2,502.44). About 40 per cent of households were willing to pay ¢3,000 per month as premium. Income, occupation, level of education and number of children per household were some of the significant factors affecting the level of premiums. All these factors, with the exception of primary occupation, were positively related to the level of premium. For primary occupation, farm-households were willing to pay lower premiums compared to non-farm-households.

The study's findings are relevant for policy decision making on health care financing in general, and for malaria control, in particular. Empirical studies on treatment seeking for malaria consistently show self-medication to be preferred as the initial attempt by households due to the high cost of government and private health facilities. Our results demonstrate that a national insurance programme which encourages "pre-saving" towards treatment fees could curtail self-medication and delays in seeking care, thereby promoting early and efficacious treatment for malaria. It is important to state that early and efficacious treatment of malaria is one of WHO's recommended approaches to malaria control at the household level.

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