

A study of malaria care provider choice in Ghana

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Abstract

Improved understanding of the factors that influence malaria care seeking behaviour is necessary in order to enhance the effectiveness of current malaria control strategies. This paper empirically examines the factors that affect household choice of malaria treatment options in Ghana. The treatment options considered were choice of a public provider of health care, a private provider, purchase of drugs from a drug store, or self-medication. The results indicate that treatment and time costs are significant factors affecting the choice of health care provider. Education and household size also play an important role in malaria care seeking behaviour. The demand for malaria care is inelastic with respect to costs, and the magnitudes of the elasticities suggest that malaria care is a necessity. The policy implications are addressed.

Keywords: Malaria; Health care provider choice; Multinomial logit model

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1. Introduction

According to the World Health Organization (WHO), malaria is the world's most important parasitic disease, and it kills more people than any other communicable disease except tuberculosis. The disease is endemic in 100 countries and about 2 billion people (about 40% of the world's population) are at risk [1]. 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 [2]. Malaria is caused by a protozoan parasite belonging to the genus *Plasmodium* and is transmitted through the bite of the Anopheline mosquito. Apart from the fact that malaria can be fatal, especially in children, it is a physically debilitating that imposes a high economic cost on the population. For example, the total treatment cost for an episode of malaria in the Kabale district in Uganda averaged around US\$9 for adults and US\$4 for children [3]. Monthly per capita household expenditures on malaria-related preventive methods ranged between US\$0.65 in rural Ghana to US\$3.88 in urban Cameroon [4, 5].

Ettling et al. [6] found that the total annual cost of malaria to low income households in Malawi was US\$24.89, which is equivalent to 32% of household income. Leighton and Foster [7] estimated that total household costs amounted to 9-18% of annual income for small farmers in Kenya, and 7-13% in Nigeria. They estimated the total annual value of malaria-related production losses to be 2-6% of GDP in Kenya and 1-5% in Nigeria. Shepard et al. [8] estimated the overall economic cost of malaria morbidity and mortality in SSA to be US\$3.15 per capita, equivalent to 0.6% of SSA's GDP in 1999 prices. Finally, Gallup and Sachs [9] found that a 10% reduction malaria was associated with 0.3% higher economic growth per annum. Given that many households in SSA live on

less than US\$1, the estimated amounts for malaria treatment represent a substantial proportion of their income.

Efforts to control the disease have included development of antimalarial drugs and an effective vaccine. Current malaria control measures include promoting the use of insecticide-treated bednets (ITNs) or non-treated bednets, screening of residential dwellings, use of mosquito repellents, improving drainage systems, and clearing of surroundings. Vaccination is perceived as one of the best options for malaria control. However, pending the development of an effective malaria vaccine it is important for individuals and countries to take measures to minimize the economic and physically debilitating effects of the disease. The Roll Back Malaria (RBM) campaign led by WHO is the current international strategy to control malaria and the aim is to cut down to 50% the current burden of malaria by 2010 [10]. Unlike previous attempts to eradicate malaria RBM emphasizes efficacious and cost-effective control strategies and promotes the use of local capacities and health systems.

The aim of this paper is to empirically examine the factors that affect household choice of malaria treatment options in Ghana. Understanding the factors that influence malaria treatment seeking behaviour is necessary in order to improve malaria control, in particular, and health care, in general. For example, a better understanding of local perceptions, attitudes and behaviour towards malaria would assist policy makers to design appropriate public awareness programs. The remainder of the paper is organized as follows. Section 2 discusses the alternative malaria treatments and the factors affecting choice of treatment option, including results of empirical work in this field. Section 3 describes the methodology, including the survey design and the empirical model. This is

followed by a discussion of the results. The final section contains the conclusions and policy implications.

2. Alternative malaria treatments and factors affecting choice of treatment option

In Ghana the alternative treatments for malaria can be grouped into the following broad categories: home remedies (referred to as self-medication or self-care in this paper), traditional medicine, consultation at drug stores, and formal (western) malaria care. Formal malaria care can be obtained from trained health professionals either at private or public clinics and hospitals. Home remedies and traditional medicines are examples of the alternative indigenous approaches to treating malaria. Home remedies include the use of local herbs for preparing concoctions that are ingested, smeared on the body or used in some other way with the aim to treat suspected malaria. A modern form of home remedy is the use of self-prescribed therapeutic drugs or left over prescription drugs. Antimalarials such as chloroquine can be purchased over the counter from pharmaceutical shops (referred to as ‘drug stores’) or from street vendors. Usually people buy whatever they can afford and not necessarily the correct dosage for effective treatment of an episode. Traditional medicine involves the purchase and use of medicinal preparations (prepared from local plant or animal material but may include manufactured pharmaceuticals) from traditional healers or ‘spiritual’ healers.

Health care seeking behaviour in many SSA countries can be a complex process influenced by cultural beliefs, socioeconomic and other factors. Knowledge about households’ or caregivers’ correct recognition of malaria signs and symptoms, as well as the factors that affect their treatment seeking behaviour, are crucial for the success of the

current control efforts. Recent studies indicate that caregivers from Ghana and Kenya tend to be well-informed about the major symptoms of malaria [11-13] compared to their counterparts in Tanzania [14]. Knowledge and treatment seeking behaviours in areas where malaria transmission is infrequent but can occur at epidemic proportions may be different from that existing in areas with seasonal or perennial transmission of malaria [3]. However, even in places where people have a good knowledge of symptoms and cause of the disease, there is evidence that individual and structural barriers prevent people from seeking prompt and effective treatment. The large number of deaths resulting from malaria has been attributed to delays in seeking appropriate care [15-17]. Studies conducted in Ghana, Kenya and Tanzania indicate that a significant proportion of caregivers perceive uncomplicated malaria to be a mild disease. However, they associate severe or cerebral malaria with evil spirits [12, 13, 18, 19]. In such cases, spiritual healers are usually approached for healing.

Other factors that affect malaria care-seeking behaviour include monetary factors (treatment costs, including user fees, and household income) [5, 20-22], nonmonetary factors (e.g. travel time) [21, 23], access to a health care facility [24], quality of care [25], and epidemiological factors such as the prevalence of different malaria species and immunity levels. Evidence from Malawi [3] indicates that expenditure on malaria treatment can be highly regressive, consuming a much higher proportion of income in the poorest households. For example, the direct costs of treatment amounted to 28% of household income amongst low-income households and 2% amongst the rest. Mwabu et al. [25] found that increase in household income shifts demand from the informal health care sector to the modern sector, with much of this demand ending up in private and

mission-run clinics. Health care demand decreases with user fees and with greater distance to a health care facility, but increases with income. Following Acton's [23] ground breaking work demonstrating the important role that time plays in the rationing of medical services, several studies [5, 20, 21, 25-28] have reported the significant effect of time price on the demand for medical services.

Unlike previous developing country studies that consider general outpatient demand [21, 25-27, 29-31], this study considers a single disease – malaria. The study also differs from previous studies on malaria care demand [5, 24, 32] by comparing the behavior of rural and urban communities where the full range of treatment options are available. Bonilla and Rodriguez [32] examined time-losses and labour reallocations within households in rural Columbia in order to shed light on the economic consequences of malaria. De Bartolome and Vosti [24] carried out a case study of malaria treatment in a Brazilian colonization project. However, that study considered only binary treatment options namely, private or public clinics, thus precluding self-care and treatment from other sources. Unlike the Brazilian situation, self-care for malaria treatment is common in Ghana as well as in other developing countries. Asenso-Okyere et al. [5] focused exclusively on malaria care demand in rural areas where there is limited choice of health care facilities. Thus, the determinants of malaria care services in communities with formal and informal health care facilities have not been adequately investigated.

3. Methodology

3.1 Survey design

The data for this study were obtained in face-to-face 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. Ghana's population in 1997 was estimated at 17 million, the majority (about 70%) of which lives in rural areas and is predominantly engaged in agriculture. 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, while the Volta region is mainly rural and has higher levels of poverty [33].

Four focus group discussions (FGDs) were conducted in each community to explore the people's views about the main causes, local terms, symptoms and signs and treatments of malaria and other common diseases. Participants in the FGDs included parents/caregivers of children under 10 years in small groups of eight to twelve people. Key informant interviews of community health workers, and community elders were also conducted to further explore local knowledge of malaria. The results of the FGDs and key informant interviews were then used to develop a semi-structured questionnaire which was pre-tested prior to the final survey on household malaria treatment seeking behaviour.

The sampling frame for the survey consisted of all households in the two selected communities. The cluster sampling technique was employed to select the household

sample. Landmarks such as roads and other prominent features were used to divide the community into clusters which were assigned numbers. The numbers were randomly drawn from a box and all households within a selected cluster were interviewed. For purposes of the study, a household was defined as a group of people who live under the same "roof" and partake of communally prepared food for a period of three months preceding the interview.

All malaria cases (involving children and adults) identified in the selected households within the four weeks preceding the date of interview were considered in the survey. Personal rosters were generated for each household member documenting their demographic profiles, level of education attained and the period they had lived in the community. Morbidity search data were collected for each identified case including the following: (i) signs and symptoms used to identify the reported malaria case; (ii) all treatment activities undertaken; (ii) the principal advisor(s) for each treatment activity; (iii) costs incurred while seeking each type of treatment; (iv) number of days that elapsed before treatment was initiated; and (v) how long it took before the patient was cured or a particular treatment option was declared a failure. Information on household income was collected using the expenditure method. Household incomes are difficult to estimate in developing countries and the expenditure method has been found to be a more reliable approach [33]. Mothers/caregivers were the principal respondents to the survey questions. However, the entire household including patients who could communicate participated in the survey, answering specific questions relating to them. The principal breadwinners (e.g. mother, father or grandparent), for example, were invited to answer

questions relating to expenses incurred in treating the identified cases and/or household income.

In total, 228 households (1448 individuals) were sampled in the two selected communities. However, after adjusting for incomplete information the final sample size came to 182 households. It is important to note that although the unit of analysis is the household, it is the malaria cases that were used in the empirical model as observations. Since some households reported more than one malaria case, a sample of size of 231 observations (or malaria cases) were used to model malaria care seeking behaviour. Table 1 shows the mean values of the main socioeconomic characteristics of the sample.

[Table 1]

Average annual household income (represented by annual expenditure) was ₺4.61 million (US\$2,105). Approximately a quarter of the respondents were males, and average household size was 4.3. In order to ascertain how representative our sample was of the general population, we compared some of the sample characteristics with equivalent measures in the 1999 Ghana Living Standards Survey [34]. The results (see Table 1) indicate a close correspondence for household size and household income.

Since early diagnosis and treatment is one of the formal malaria control measures adopted in Africa, the analysis in this study focuses on the choice of the first provider visited in the reference period. One advantage of using the first provider visit is that the dependent variables (i.e., the treatment options) are mutually exclusive and therefore logit analysis could be used. The survey instrument was therefore designed to seek information for the first treatment action and the interviewers were trained to probe the responses on the initial treatment attempts made by households.¹

3.2 Model specification

It is assumed that households (or individuals) derive utility (U) on the basis of their health status (H_j) acquired from consuming health care and other goods. Suppose that the health of the infected individual depends on the type of treatment he/she receives (Z) and the severity of the attack (S). In addition, the individual's health depends on his/her innate resistance to malaria, which in turn, depends on the individual's demographic characteristics (W). The household's health function can therefore be written as

$$H_j = H_j(Z, W) \quad (1)$$

Severity of attack is a scalar variable with a threshold value of S^* and increasing severity is associated with a worsening health condition. It is assumed that households choose to treat malaria if severity exceeds the threshold value (i.e., $S^* \leq S$).² Z is an indicator variable where $Z=1$ if the individual receives treatment from an external health care provider (public clinic, private clinic, or drug store) and $Z=0$ if the individual opts for self care. The choice of self-care is assigned a value of zero and is used as the normalised treatment option since this alternative is available to all households. Households are assumed to choose a particular external health care provider if they perceive the services of that provider to be of a higher quality compared to self-care and other alternative providers. The household budget constraint can be expressed as

$$Y = (P_j + vT_j)H_j + (P_n + vT_n)Q_n \quad (2)$$

where P_j is the user fee charged by provider j per malaria episode; P_n is the price of self-care; v is the individual's opportunity cost of time; and T is the time spent traveling to the provider and waiting for care. The total price of obtaining malaria care from provider j can

be written as $C_j = (P_j + vT_j)$. Setting the price of the *numeraire* good, $(P_n + vT_n)$, to unity, the budget constraint can be written as

$$Q_n = Y - C_j H_j \quad (3)$$

Considering the choice of an external health care provider and self-care, respectively, the budget constraint in (3) can be re-specified as

$$Q_n = Y - C_j \quad \text{for } j \in J, \text{ and } j \neq 0 \quad (4a)$$

$$Q_n = Y \quad \text{for } j = 0 \quad (4b)$$

Where J is the total number of health care providers. The household's indirect utility function can be expressed in terms of its health status and budget constraint as follows:

$$U = U(H_j(Z, W), Y - C_j) \quad (5)$$

It is assumed that Equation (5) is a well-behaved utility function that depends on exogenous health factors and prices.³ For a given state of nature, W , utility is assumed to increase with household income. Following Lavy and Quigley [28], it is assumed that there are no costs associated with self-care. That is, self-care is assigned a value of $C(0,0)$, and the choice of an external care provider j is associated with specific time and money costs, which is assigned a value of $C(i, j)$. For an individual whose severity of malaria depends on W , U_{ij} represents the utility derived from $C(i, j)$. The utility associated with a provider's care is assumed to be stochastic and is written as

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (6)$$

where the observable (deterministic) component of the utility function is

$$V_{ij} = \alpha_{ij} + \beta(Y - C_{ij}) + \gamma_{ij}W \quad (7)$$

and ε_{ij} is an additive error term. The observable component of the utility associated with the self-care alternative is

$$V_{i0} = \alpha_{i0} + \beta Y + \gamma_{i0} W \quad (8)$$

The provider and self-care utility functions in a log-linear specification are represented,⁴ respectively, as

$$V_{ij} = \alpha_{ij} + \beta \ln(Y - C_{ij}) + \gamma_{ij} W + e_{ij} \quad (9)$$

and

$$V_{i0} = \alpha_{i0} + \beta \ln(Y) + \gamma_{i0} W + e_{i0} \quad (10)$$

As is well-known in the discrete choice literature, the observed choice depends on the difference in utility and not on the levels of utility *per se*. Normalising on self-care yields

$$V_{ij} - V_{i0} = \alpha_{ij} - \alpha_{i0} + \beta \ln(1 - C_{ij}/Y) + (\gamma_{ij} - \gamma_{i0})W + e_{ij} - e_{i0} \quad (11)$$

$$\approx \alpha_{ij} - \alpha_{i0} - \beta(C_{ij}/Y) + (\gamma_{ij} - \gamma_{i0})W + e_{ij} - e_{i0} \quad (12)$$

where C_{ij}/Y is the proportion of income spent on malaria care and also represents price-income interaction in the model. A reduced form model that allows utility to vary by alternative can therefore be specified as

$$V_j = \beta_{1j} - \beta_{2j}(C_j/Y) + \gamma_j W + \varepsilon_j \quad (13)$$

The subscripts on the constant term in (13) show that the intercept varies by provider and therefore allows an observation of the difference in the household's perceived quality for the different providers.

The number of health care provider alternatives, J , is classified into $m = 2$ groups (external care and self-care), with three alternatives (public, private, drug store) in the 'external care' group. Assuming that the error terms associated with alternative health care providers are identically and independently distributed Weibull functions, the probability (P_{ij}) of choosing a malaria care provider $j \in J$ in the i^{th} group can be specified as

$$P_{ij} = \frac{\exp(V_{ij})}{\sum_{m=1}^J \exp(V_{im})} \quad (14)$$

It is assumed that the health care providers form a set of mutually exclusive choices. Each sample household is a random and independent draw from the universe of households. Thus, the logarithm of the likelihood function, L_i , for the observable sample of households, N , is given by

$$\ln L_i = \sum_{i=1}^N \sum_{j=1}^J D_{ij} \ln P_{ij} \quad (15)$$

where D_{ij} is a dichotomous variable that takes on the value unity if the household chooses alternative j and zero otherwise.

3.3 Variables and a priori expectations

The dependent variable is the probability of choosing a malaria care provider, while the estimated coefficients of the variables indicate how changes in each of the independent variables affects household choice for malaria care provider relative to self-care. The signs on the coefficients show the direction of the odds of choosing an alternative provider instead of self-care. Based on economic theory and previous studies, we hypothesize that the choice of malaria care provider depends on household income, treatment costs, travel and waiting time, and other socio-economic variables (see Table 2).

[Table 2]

A priori, we expect a negative relationship between treatment, travel and time costs and the probability of choosing a malaria care provider. In addition to income, other demographic characteristics that could affect the household's choice of malaria care service provider include age, education, gender, family size (numbers of adults and

children), severity of malaria, and number of healthy days. We use age and the number of healthy days as a proxy for health status. We hypothesize that older people are more likely to select self-care relative to external care due to their reduced spending power and we therefore expect a negative coefficient on age. We also expect a negative sign on the coefficient of 'healthy days' because the longer individuals stay healthy the less likely they are to seek external care when sick. We hypothesize that a more educated household head (or decision maker) will be better able to follow prescribed treatment and therefore is likely to choose an external health care provider over self-care. Thus, the coefficient on age is expected to be positive.

Regarding family size, we hypothesize that the greater the number of adults and the fewer the number of children, the more likely the household is to self-medicate. Therefore, we expect a positive coefficient on family size. We expect that households are more likely to self-medicate if they believe the malaria symptoms are not severe. Therefore, we expect a negative sign on the coefficient of severity. We also included gender and pregnancy status as additional explanatory variables. We have no *a priori* expectations on the signs of these variables but we wanted to investigate whether they are important factors affecting malaria care seeking behaviour.

4. Empirical Results

4.1 Knowledge and perceptions of malaria in the study communities

Most of the respondents (93.7% and 96.2% in Amasaman and Hohoe, respectively) perceived malaria to be a major health problem. Because malaria is endemic in the study communities, almost all respondents in the samples had some knowledge about malaria.

About 43% of the respondents in Amasaman and 75.6% in Hohoe, however, believed that there are different types of malaria and most of them mentioned jaundice as the other type of malaria. This finding is consistent with the findings of Agyepong [11] that residents in the West Dangbe district of Ghana perceive malaria to be of two kinds: *asra* and *asraku* (local names for mild and severe malaria/fever).

There is currently no established set of symptoms by which malaria can be identified apart from laboratory tests. However, the key informant survey revealed that there is a set of symptoms which households use to identify the disease. Furthermore, there is evidence of a correlation between traditional symptoms and laboratory confirmation of malaria. Agyepong [11] found that about 70% of those in the West Dangbe district in Ghana who thought they had malaria using traditional symptoms tested positive for the disease, while about 20% of those who thought they did not have malaria were also positive. Jackson [35] has also reported similar findings for Liberia. The correlation between traditional symptoms and actual confirmation seems to be quite high because most village health workers depend on the symptoms to identify the disease in the absence of laboratory facilities.

Table 3 presents respondents' rankings of the symptoms used by households in Amasaman and Hohoe to identify malaria. It can be seen that the three most important symptoms that households associate with malaria are headache, chills and high body temperature. It is important to note the possibility that some respondents may report fevers other than malaria, therefore the disease discussed for the sample may more appropriately be described to as "malaria/fever".

[Table 3]

4.2 Multinomial logit model estimation results

The multinomial logit (MNL) model of malaria care provider choice was estimated by maximizing the log likelihood function (Equation 15) using the full information maximum likelihood procedure.⁵ The empirical results are reported in Table 4.

[Table 4]

It can be seen that treatment cost has the expected negative coefficient and is significant for both groups of respondents. This finding is consistent with the results of Asenso-Okyere et al. [13], de Bartolome and Vosti [24], Gertler and van der Gaag [26], Lavy and Quigley [28], and Dzator [36], among others. Waiting time has the expected negative sign but is not statistically significant. This finding is surprising given that public health facilities in particular are characteristically associated with long waiting times. Travel time has a negative statistically significant effect on choice of provider for Amasaman residents but not for Hohoe residents, but is significant for the combined sample. This implies that households in Amasaman have a higher probability of reducing the utilisation of a provider's service the longer it takes to travel to the facility in contrast to residents of Hohoe. This difference can be explained by the fact that residents in Amasaman (a predominantly urban community with a higher per capita income) have a higher opportunity cost of time than those of Hohoe (a rural community with a lower per capita income).

Of the demographic variables, age has the hypothesised sign but does not significantly affect the choice of any of the three external care options relative to self-care. Regarding gender, it appears that females have a tendency to seek external care compared to males, although the significance of this relationship is only confirmed for

the Hohoe subsample where females have a higher probability of seeking treatment for malaria from a public health care provider compared to males. The more literate households tend to seek treatment from a private health care provider rather than self-medicate, and they are also likely to choose a public health care provider over self-care. Households with more children are more likely to select a private health care provider over self-care, but are more likely to opt for self-care over a public health care provider. A possible explanation for this result could be that private health care providers operate for longer hours and are therefore more convenient for working families. Households with more adults are likely to purchase treatment from a drug store.

Pregnancy status and severity do not appear to be significant factors affecting malaria care seeking behaviour. The variable 'healthy days' has a negative coefficient for the three providers as expected, but is significant for only private health care providers. This result is not a surprising since healthy people do not require medication, implying that malaria control measures are important in reducing the burden on health care facilities.

Table 5 presents estimates of own-price demand elasticities of the significant price variables computed for the combined sample at the means of the independent variables.

[Table 5]

A 10% increase in treatment costs will reduce demand for malaria care by 2.1% at public health care providers and 0.4% at drug stores, while a 10% increase in travel time will reduce demand for malaria care by 3.6% from public health care providers and 1.3% from drug stores. These results indicate that demand for malaria care is generally inelastic with respect to time and treatment costs and is a necessary good. However, in terms of treatment

and time costs, demand is relatively more inelastic for drug stores compared to public health care providers and private health care providers in that order of magnitude.

To test the plausibility of our results, we compared our elasticity estimates with various developing country health care demand studies (see Table 6).

[Table 6]

These studies consider general health care demand and are therefore not strictly comparable to ours. Nevertheless, they do provide a benchmark for the general order of magnitude of our elasticity estimates. Gertler and van der Gaag's [26] nested multinomial logit (NMNL) estimates for own price elasticities for professional care in Cote d'Ivoire range from -0.12 to -2.82 for treatment costs and from -0.11 to -1.88 for time costs. Using various models including hedonic expenditure functions, Generalised Least Squares and NMNL, Lavy and Quigley [28] estimated own price elasticities of between -0.19 and -0.13 for intensity of treatment and -0.18 and -1.82 for quality of treatment for health care demand in Ghana. Mwabu and Wang'ombe [38] estimated the own price elasticity of demand for outpatient visits in Kenya to be between -0.03 and -0.20. Bouldoc et al. [39] obtained much higher estimates using probit (-1.16 to -4.26) and independent probit models (-1.52 to -5.65). However, their results using Ordinary Least Squares are within the range obtained in this study. It is expected that differences in estimates will arise between studies due to differences in the underlying assumptions of the various models and techniques, as well as the types of data collected. However, in general, we can conclude that our estimates lie within the range for health care demand elasticities in developing countries, lending some support for their robustness.

Like all economic models, our MNL model suffers from a number of limitations. First is the problem of omission bias. It is not possible that all the relevant variables affecting the choice of malaria care provider have been captured in the model. For example, in Ghana, an informal credit system referred to as *susu* is likely to play an important role in health care provider choice. Unfortunately, we were unable to include this variable in the model. However, the magnitude of the omission bias problem is unlikely to be large given that we have included important variables such as treatment costs, time costs, waiting time and key socioeconomic variables. The second more serious problem is the independence of irrelevant alternatives (IIA) property to which the MNL model is susceptible. This refers to the assumption that the odds of a particular choice are unaffected by the presence of additional alternatives. We tested for the IIA property using Hausman and McFaddens' test [40] and we found that in most cases the IIA property in the MNL models was not violated.⁶

5. Conclusions and policy implications

The main findings of the study are that treatment and time costs have a significant negative effect on the choice of malaria care provider. Of the socioeconomic variables, education and household size play a significant role in malaria care seeking behavior. The more educated a household is, the more likely it is to seek treatment at a private health care provider compared to self-medication. Furthermore, households with more children are more likely to select a private health care provider over self-care, but are more likely to select self-care over a public provider. There was some weak support for gender as a factor in malaria care seeking behaviour. Females in Hohoe (a rural area) have a higher

probability of seeking care at a public provider. In general, the study results confirm the fact that demand for malaria care is inelastic with respect to costs, while the small magnitudes of the elasticities indicate that it is a necessity.

The study results have a number of important implications for RBM, in general, and Ghana's malaria control strategy, in particular. The majority of malaria cases identified in our sample were managed first at home with herbal preparations, left over drugs or over the counter drugs. This finding is consistent with previous studies in Ghana (11, 12, 41) and other parts of SSA (42-44) that establish polypharmacy as a common practice in the region. While the most desirable strategy is to encourage people to seek hospital-based treatment, the fact of the matter is that self-medication will remain a popular choice due to economic and/or structural factors such as lack of access to health care facilities. Thus, there is a need for programs to educate the public on the correct dosage of malaria tablets to take as a prophylactic and for treatment when sick.

Operators of pharmaceutical shops (drug stores) are the first point of contact for households undertaking self-care. They are therefore an important link in efforts to control malaria. However, the majority of these personnel have little or no training in the provision of health services. Given that the use of local capacities and health systems is one of the cornerstones of the RBM campaign, we recommend that policy makers should focus on building the capacity of drug store operators, particularly in diagnostic and other relevant skills so as to promote the early diagnosis and treatment strategies adopted in Ghana. It would also be beneficial to the country to involve the operators in the design and delivery of local malaria prevention and treatment strategies.

The study's findings confirm the well-known fact that monetary factors such as treatment cost and income are important variables affecting the choice of malaria treatment option. These issues should therefore be addressed in the current malaria control strategy. Apart from improving the availability and affordability of malarial drugs, we advocate increased promotion of preventive strategies such as the use of ITNs and chemoprophylaxis. However, the problem with bednets is that they are generally not available in rural areas. In such areas, access is often restricted to those who can afford to buy them from urban centres. Recent initiatives such social marketing aim to improve access by providing nets at subsidised prices. However, it has been suggested that it may actually be more cost-effective to provide bednets for free through existing infrastructures such as antenatal clinics. Doing so could cost US\$4 per ITN [45]. Even so, it is doubtful whether cash-strapped governments in malaria endemic countries can afford to cover these costs. There is therefore a need for financial support from initiatives such as the Global Fund to Fight AIDS, Tuberculosis and Malaria and individual donor countries.

Many countries in SSA have moved to a user fee (or 'cash and carry') system in the public health sector. It is inevitable that prices will have to rise in order to achieve full cost recovery. Our results indicate that, in relative terms, increased fees will lead to a choice of self-care over external care. One way the government could encourage the use of health care facilities would be to promote a nation-wide national health insurance scheme. Such a scheme would encourage "pre-saving" towards treatment fees and would curtail self-medication and delays in seeking care, thereby promoting early and efficacious treatment for malaria. A recent study found that the majority of Ghanaian households would be

willing to pay a monthly premium of approximately ₵2,500 (US\$1.14) if such a scheme were implemented [46].

In recent years, there has been an increase in the growth of private facilities in Ghana as the public infrastructure has deteriorated due to lack of maintenance and capital investment. There is a need for the government to improve the regulation of private health facilities and drug pricing in order to protect the public's welfare and improve malaria treatment. There is also the need for more public education programs to discourage self-medication since the misuse of malarial drugs would promote the resistance of malaria parasites to the drugs. Also the education program is required to encourage early reporting of malaria symptoms before the disease becomes severe.

To conclude, it is useful to draw a number of caveats. Problems inherent in the model were briefly discussed in the previous section. Furthermore, household surveys of this type are prone to respondent recall errors. Thus, although this study has generated some insights into malaria care seeking behaviour, caution must be exercised not to use the model to predict health care demand or to make resource allocation decisions. Future work could investigate the use of less restrictive models such as the multinomial probit and the independent multinomial probit models.

Notes

1. A copy of the survey instrument is available from the authors upon request.
2. A threshold is relevant here because a household will take no action if it perceives the symptoms not to be severe.
3. This assumption implies that the function is monotonic in its variables and is differentiable.
4. Gertler and van der Gaag [26] show that such a function is consistent with well-ordered preferences.

5. A nested multinomial logit (NMNL) model was also estimated but it did not perform better than the MNL. Also a specification test using the inclusive value indicated that the MNL model cannot be rejected in favour of the NMNL model.
6. The Hausman and McFadden test involves estimating the MNL with all the choice options (unrestricted model) and a restricted subset of the full-set choice model (restricted model) and testing for the significance of the chi-square statistic.

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Table 1
Socioeconomic characteristics of the sample^a

	Household expend. p.a. (million cedis)	Education (years)	Age (years)	No. of Males (%)	Household size	Sample size
Community:						
Amasaman	6.06	9.7	32.9	19 (20)	4.3	96
Hohoe	3.01	9.5	34.0	29 (34)	4.1	86
Total	4.61	9.6	33.5	48 (26)	4.3	182
1999 GLS Survey ^b	4.24	-	-	-	4.3	5998

Notes:

- a. Data refer to sample means unless otherwise stated.
- b. GLS Survey refers to Ghana Living Standards Survey. Source: Ghana Statistical Service [34].

Table 2
Variable description

Variable	Definition
Dependent variable:	
Probability of choosing a malaria care provider	Probability of choosing self-care versus external care which has three alternatives (public, private, drug store)
Explanatory variables:	
Facility price:	Total or lump sum payments made to seek care
Waiting time:	Opportunity cost of waiting time at facility
Travel time:	Opportunity cost of travel time
Gender:	Gender of patient (male=1, female=0)
Age:	Age of the patient in years
Education:	Years of formal schooling of the person who decided the type of treatment obtained
Severity:	Perceived severity of malaria (severe=1, mild=0)
Pregnant:	Pregnancy status of sick adult females (pregnant =1, otherwise 0)
Adult:	Number of adults (18 years and over) in the household
Children:	Number of children (<18 years) in the household
Healthy days:	Number of healthy days within 28 days from the day of interview

Table 3
 Ranking of malaria symptoms by residents in the study communities

Symptom	Order of ranking by Amasaman residents	Order of ranking by Hohoe residents
1. Headache	1	2
2. Chills	2	3
3. High body temperature	3	1
4. Vomiting	4	8
5. Loss of appetite	5	5
6. Bodily weakness	6	5
7. Yellowish urine	7	6
8. Bitter taste	8	4
9. Vague feeling	9	15
10. Dizziness	10	7
11. Sleeplessness	11	9
12. Pale looking	12	10
13. Nausea	12	11
14. Perspiration	13	12
15. Yellowish palm	14	16
16. Delirium (bad dream)	14	13
17. Yellowish eye ball	15	14

Source: survey data.

Table 4
Multinomial logit model results

Variable	Amasaman residents		Hohoe residents		Combined Sample	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Price variables						
Treatment cost/Income ^a	-0.23	1.64*	-0.75	1.93**	-0.20	1.99**
Waiting time/Income ^a	-0.15	0.39	-0.19	1.00	-0.10	0.60
Travel time/Income ^a	-10.35	1.95**	-0.82	0.48	-4.92	1.99**
Public provider						
Constant	3.68	1.47	5.14	2.03**	2.79	1.89**
Age	0.09	0.39	-0.18	0.82	-0.11	0.79
Gender (male=1, female=0)	1.07	1.51	-2.27	1.94**	0.17	0.36
Education	-1.30	1.73*	0.18	0.28	-0.46	1.08
Severity (mild=1, severe=0)	-0.46	0.70	-0.58	1.70	-0.56	1.23
Pregnant (pregnant=1, otherwise=0)					0.07	0.05
Child	-0.30	1.20	-1.02	2.44***	-0.37	2.03**
Adult	0.08	0.35	-0.40	1.17	-0.04	0.21
Healthy days	-0.98	1.31	-0.98	1.37	-0.69	1.58
Private provider						
Constant	3.82	1.65*	-0.88	0.39	0.98	1.72*
Age	-0.21	0.96	0.05	0.22	-0.17	1.26
Gender (male=1, female=0)	-0.16	0.25	-1.10	1.14	-0.02	0.00
Education	1.08	1.63*	1.76	2.10**	0.94	2.28**
Severity (mild=1, severe=0)	-0.68	1.10	-0.15	1.68	-0.41	1.66*
Pregnant (pregnant=1, otherwise=0)					1.52	1.07
Child	0.49	2.19**	-0.06	0.17	0.34	2.26**
Adult	0.03	0.14	0.34	1.19	0.12	0.79
Healthy days	-1.97	2.81***	-1.37	2.34***	-1.21	3.21***
Drug store						
Constant	-1.99	0.77	0.67	0.48	-0.22	0.19
Age	0.08	0.39	-0.02	0.18	-0.05	0.48
Gender (male=1, female=0)	-0.22	0.39	0.50	1.02	0.19	0.54
Education	0.35	0.60	0.50	1.21	0.48	1.52
Severity (mild=1, severe=0)	0.72	1.36	0.14	0.30	0.35	1.07
Pregnant (pregnant=1, otherwise=0)					1.48	1.24
Child	0.23	1.17	-0.29	1.50	0.03	0.27
Adult	0.03	0.17	0.43	2.57***	0.20	1.72*
Healthy days	0.37	0.45	-0.87	1.92**	-0.37	1.01
Log likelihood function	-123.51		-111.35		-271.93	
R ²	0.20		0.32		0.15	
Adjusted R ²	0.13		0.26		0.11	
Sample size	112		119		231	

Note: ***, **, * indicates significant at 1%, 5% and 10% level, respectively.

a. Household per capita expenditure less the sum of all cash payments and the opportunity costs of care is used as a proxy for income.

Table 5
Own price elasticity of demand estimates^a

Variable	Treatment	
	cost	Travel time
Public provider	-0.21	-0.36
Private provider	-0.22	-0.33
Drug store	-0.04	-0.13

Note:

a. The elasticities were generated using LIMDEP (version 7) program (Greene, 36).

Table 6
Selected own price elasticity estimates from developing country studies

Study	Econometric model	Dependent variable/ Provider/ Scope	Own price elasticity	Country
Gertler and van der Gaag (1990)	NMNL	Health care service provider	-0.12 to -2.82	Cote d'Ivoire
			-0.11 to -1.88 (own time-price elasticity)	
Lavy and Quigley (1993)	Hedonic expenditure function _(continuous) , GLS _(continuous) , NMNL	Intensity of treatment	-0.19 to -0.13	Ghana
		Quality of treatment	-0.18 to -1.81	
Mwabu and Wang'ombe (1994)	OLS _(continuous)	Outpatient visits	-0.03 to -0.20	Kenya
de Bartolome and Vosti (1995)	MNL	Private clinic	-0.05 to -0.58	Brazil
Bouldoc <i>et al.</i> (1996)	Probit	Health care provider	-1.16 to -4.26	Benin
	Independent Probit	Provider service	-1.52 to -5.65	
	OLS _(discrete)	Intensity of treatment	-0.10 to -0.36 (own time-price elasticity)	

Notes

MNL: Multinomial logit
 NMNL: Nested Multinomial logit
 GLS: Generalised Least Squares
 OLS: Ordinary Least Squares