WILLINGNESS AND ABILITY TO PAY FOR INSECTICIDE TREATED NETS IN NORTHERN GHANA

Patricia Akweongo

A dissertation submitted to the faculty of Social Science and Humanities of the University of Cape Town in partial fulfilment for the master of social science degree in Health Economics

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DEDICATION

In memory of my beloved Father, Ceasario Akweongo Akurugu

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ABBREVIATIONS

ATP	Ability To Pay
CV	Contingent Valuation
DALY	Disability Adjusted Life Years
GHAT	Ghana Health Assessment Project Team
ITN	Insecticide treated net
MOH	Ministry of Health
NHRC	Navrongo Health Research Centre
UN	United Nations
UNICEF	United Nations Children's Education Fund
US$	United States of America Dollars
WHO	World Health Organization
WTP	Willingness To Pay

ABSTRACT

Insecticide treated nets (ITNs) are a highly cost-effective tool in malaria control and has been associated with reductions in morbidity and mortality in children. Even though their efficacy has been established, the success of their use as a malaria control tool depends on their effective implementation and sustainability. The purpose of this study was to assess factors that would impact on household willingness and ability to pay for insecticide treated nets in the Bolgatanga district of Northern Ghana to provide insights into the sustainability of this tool.

The paper presents the results of a survey of 876 household heads from both the rural and urban areas of the district. The survey questionnaire was designed to obtain information on perceived causes of malaria, health seeking behaviour, use of mosquito control products, consumption expenditure, income, possession of assets and demographic characteristics of the sample population. The contingent valuation method was used to elicit households stated willingness to pay for ITNs. The survey data was complemented by focus group discussions.

Expressed willingness to pay for ITNs was as high as 92% but current usage of untreated bed nets among respondents was only 17%. The main reasons cited for low usage of nets were lack of ready cash, cost of nets and non availability. Mean maximum willingness to pay was 9120.00 cedis (US$3.8) which is lower than the current factory price of 13200.00 cedis (US$5.5). Willingness to pay was strongly determined by household size, the type of payment mechanism available, the use of untreated nets and possession of radio.

Households are also more concerned about acquiring nets for the whole family rather than for the protection of the child.

The lack of ready cash coupled with the percentage of income that poor households will require to buy insecticide treated nets will be an obstacle to net use. Poor households will require about 4.5% of total annual expenditure to be able to acquire an average of three nets adequate for the family at the expressed mean willingness to pay. At the present factory price they will need 6.6% to be able to buy three nets on average for family use compared to 1.5% from higher income earners.

Inability to purchase nets for cash was also shown by the number of households willing to pay on an instalment basis. About 56% of households were willing to pay on credit basis against 18% that wanted to pay cash. Maximum willingness to pay was also higher among households willing to pay on a credit basis than for households willing to pay cash.

Research into the feasibility of different payment schemes in local communities is very critical if this tool for malaria control is to be expanded and sustained. The feasibility of different financing mechanisms would not only reduce the initial cost of buying insecticide treated nets to households but would also increase willingness to pay and make payments for re-impregnation much easier. Research into how to protect the very poor and vulnerable should also be a focus in the promotion and use of ITNs.

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Chapter 1

INTRODUCTION

1.1 Research Problem:

Malaria remains a serious public health problem and is endemic in 90 countries; 50% of these countries are in Africa with about 40% of the world's population at risk (WHO, 1996). Africa is estimated to contribute over 90% of the annual number of malaria cases world wide, which is well over 300 million. It accounts for about 20-30% of all infant deaths in Africa (Molineaux, 1985). In Ghana, malaria is a major cause of mortality in young children and remained the leading cause of outpatient attendance and inpatient admissions in 1992 (Binka *et al.*1995, MOH, 1992). Even when it is non-fatal, malaria produces considerable impact on the health of African Children, impairing their growth and neurological development (Martin *et al*, 1993). The World Bank also ranks malaria as a leading cause of loss of disability-adjusted life years (DALYs) in Africa with an estimated 35 million future life-years lost from disability and premature death (World Bank, 1993).

The development of an effective malaria control strategy for sub-Saharan Africa has therefore been a priority among public health researchers for many years. The key strategy to malaria control has been early diagnosis and prompt treatment of presumptive malaria.

Other strategies that have been geared at controlling malaria include the prophylactic use of chloroquine for children and pregnant mothers to avoid clinical cases of malaria, environmental sanitation and the residual application of insecticide to house walls. The use of the above strategies has been only partially effective in routine programme settings. Low coverage and poor accessibility of health services mean that most people at high risk in rural Africa are seldom reached. Even for those with adequate coverage, poor compliance has been a very serious problem.

In recent years, the spread of chloroquine-resistant *Plasmodium falciparum* parasites throughout sub-Saharan Africa and resistance of the mosquito to DDT, has stimulated the search for alternative methods of malaria control. Bed nets (mosquito nets over beds people sleep in) treated with pyrethroid insecticides, an alternative, appear a simple, low-cost intervention ideally suited to rural conditions. When used regularly, there appears to be an impact on both the frequency of episodes of malaria in children and on the level of infection in the mosquito population (Winch *et al.*, 1994).

Insecticide treated bed nets (ITNs) have been proven to reduce all cause mortality in children under five years of age in the Gambia, Kenya and Ghana. In the Gambia, the use of insecticide treated bed nets was associated with a 25% reduction in all-cause mortality in children age 1-9 years within a national ITNs programme (D'Allessandro et al 1995).

In a randomized community-base trial in northern Ghana, the use of ITNs accounted for 17% reduction in all-cause mortality in children 0-6 years (Binka et

al 1996) and it accounted for 33% reduction in mortality in children in the Kenya study. ITNs have not only been found to reduce mortality in children but are also cost-effective. A cost-effectiveness study in Ghana reported that 74 child deaths were averted at an estimated cost of us US$8.9 per child year protected and US $2,034 per death averted (Binka *et al.* 1997). The Gambia study also indicated a cost per death averted of US$188 and US$ 7.9 per DHLY (Discounted Healthy Life Years) gain (Picard *et al.* 1993, Aikins 1995).

The problem that still remains on the use of ITNs, is whether these interventions are sustainable when implemented on a wide scale. The question of willingness and ability to pay of households for health services has therefore become a critical policy issue. This study thus examines factors that determine household willingness and ability to pay for insecticide treated bed nets. These factors may inform on the sustainability of this effective intervention of controlling malaria in Ghana.

1.2 Objectives of Study

The overall aim of the study is to look at the sustainability of insecticide treated bed nets on a wide scale.

More specifically, the objectives are to

1. Determine the socio-economic, demographic and health characteristics of potential users and non-users of insecticide treated nets

2. Identify factors that influence household's willingness and ability to pay for insecticide treated bed nets.

3. Estimate the effects of the explanatory variables identified in (2) above on household decision to purchase or not to purchase insecticide treated bed nets.

1.3 Rationale

Declining budgetary resources coupled with the structural adjustment programmes in sub-Saharan Africa countries make it difficult for governments to finance interventions even if they are found to be highly cost-effective. Donor organisations, specialised UN agencies, international monetary institutions and African health ministries have all in recent times advocated policies that endorse community financing of the public health sector in Africa (Arhin, 1995).

Also, patients have increasingly shared in the finance of government health services through the payment of consultation charges and purchase of drugs and other renewable items because the health institutions have inadequate health resources.

The key policy question now is what combination of public and private funds can be used to finance health services (insecticide treated nets). The most important and difficult question decision-makers at government and community level face is how

to price health services. This is important as consumer responses to prices will influence service utilisation and patterns and revenues collected.

People's willingness and ability to pay will affect the efficiency and equity of prices for health services. Willingness and ability to pay are often taken to mean the same, but while people will wish to have a service or a particular health care provided (willingness), it may not reflect actual demand for the service since that depends on the affordability (ability) of the health care to consumers. Fee schedules and prepayment schemes thus, must be sensitive to local economic conditions which may lead to wavering fees in favour of patients from vulnerable households or socio-economic groups so that their utilisation of health services does not decline.

Information on the cause-effect relationship between the propensity to purchase ITNs and some key economic, health and demographic variables from this study is helpful to policy-makers who are designing community financed insecticide treated bed net programmes. It is also expected that the present study will help in the design of insecticide treated nets educational programmes.

Chapter 2

LITERATURE REVIEW

2.1 Global Malaria Situation

Malaria is present in 102 countries and is responsible for over 100 million clinical cases and 1 to 2 million deaths each year (Oaks *et al.* 1991). Malaria remains one of the most significant causes of disease burden in Africa, and each year causes over a million deaths and 300-500 million episodes of acute illness globally (*ibid.*).

The fight to control malaria throughout the world achieved many successes in the 1950s and 1960s with the discovery of new tools including residual insecticides, such as dichloro-diphenyl-trichloro-ethane (DDT) and new antimalarial drugs such as chloroquine and amodiaquine. The applications of these effective residual insecticides and drugs led to the eradication of malaria in parts of the world with low levels of transmission (Binka 1997).

Globally, malaria remains a growing problem because of factors such as increasing drug resistance, population movements, and environmental and climatic changes. Increasing environmental exploitation, such as deforestation and irrigated farming has given rise to localised malaria problems.

The overall increase in global temperature due to ozone depletion also known as global warming, means that new areas and higher altitudes become zones of malaria transmission affecting populations that were previously not at risk (Chavasse *et al.*, 1999). Mainly, climatic change led to several countries like Namibia, Zaire, Ethiopia, Rwanda, Madagascar and others experiencing epidemics which claimed several lives and led to the impoverishment of the affected communities (WHO, 1992; WHO, 1993).

Efforts to control malaria over the past decades have met with little success. World wide, the number of cases of malaria caused by *plasmodium falciparum*, the most dangerous species of the parasite, is on the increase. In many regions where malaria had been almost been eliminated, the disease has made a comeback surpassing earlier recorded levels.

The obstacles to effective malaria control are several fold including lack of comprehensive malaria programmes at the peripheral levels, financial and managerial resources, lack of trained resource personnel and lack of involvement local communities.

2.2 Country Profile

Ghana is a medium sized anglophone country, about 238.5 thousand square kilometres in size. It lies on the west coast of Africa, with Côte d'Ivoire to the west and Togo to the east and bordered by Burkina Faso to the north. There are three

main ecological zones, corresponding to vegetation of the coastal savannah, forest, and Guinea savannah. In the southern part of the country, there are two rainy seasons (April-July and September- November), while in the north rainfall occurs in only a single season between April and September followed by a long dry season dominated by harmattan (very dry, cold and dusty weather from the Sahara). There is much uniformity as regards mean temperatures, which average 26°-29°C and these temperatures coupled with equally high relative humidity produce conditions suitable for mosquito breeding.

2.2.1 Population

The 1993 population estimate for Ghana was 16.4 million. During 1990-96, according to World Bank estimates, the population increased by an annual average of 2.7% and in mid-1991, according to official estimates, was 15.4 million, with a density of 64.6 inhabitants per square km.

The population estimate for the year 2000 is 20.2 million (World bank, 1994). The current rate of population explosion is likely to have major consequences on the already strained excreta disposal systems, clean water supplies, and housing. These deteriorating conditions will only produce a favourable condition for mosquito breeding and the current malaria situation in the country may worsen.

2.2.2 Economy

Ghana is a low-income economy. The total gross domestic product (GDP) for 1993 was US$6.1 billion with a GDP per capita income of US$430 for that same year. This level of per capita income is slightly lower than the average for sub-Saharan Africa of US$555. During 1980-1991, real GDP was 3.4%. Real growth rate was below the population growth rate which averaged 3.2% per year and outpaced the 2.1% growth in food production (Paul, 1994). These numbers imply that income per capita declined in this period and food production per capita declined even faster.

The 1996 estimate of external debt was US$5 billion, representing about 90% of GDP and a debt service of about 27% of total exports. This only goes to worsen an already poverty stricken economy.

Slow economic growth and record of budget deficits in the 80's have forced reductions in public spending including public spending on health services.

In terms of income distributions, incomes are fairly skewed. The top quintile earners receive 44.1 of total income compared to 7% for the bottom quintile. The Gini-coefficient (0= perfect equality; 100=perfect inequality) which shows the level of inequality in income distribution in an economy was calculated to be 40 for Ghana and has be fairly stable from 1985 to 1992. From 1980 to 19989, the percentage of Ghanaians in absolute poverty, defined as the "income below which a nutritionally adequate diet plus essential non-food requirements is not affordable"

was 59% in the urban areas and 37% in the rural areas (World bank, 1994). The inequality of income distribution coupled with low incomes has an impact on the health sector since it only produces a small number of income earners who can afford to pay for health services.

2.2.3 Agriculture

Ghana is relatively more agrarian and less industrialised compared to the rest of Sub-Saharan Africa. Agriculture is the main predominant activity and the largest source of employment.

In 1993, It was estimated that there were 6 million Ghanaians employed and with about 48.1% of those employed in agriculture. The main export crops are cocoa, gold and timber.

Ghana like any other sub-Saharan African country has a narrow resource base and its main economic sector, agriculture is solely dependent on the weather. Most crops are rain-fed and food outputs therefore remain unpredictable and food self-sufficiency fragile (Paul 1994). The poor weather conditions only goes to exacerbate the poverty levels already entrenched in the economy and leads to a general poor health status of the population.

2.2.4 Health Profile

In terms of health status indices, Ghana is at par with the rest of sub-Saharan Africa. Life expectancy at birth in 1993 was 56.2 years slightly higher than the average of 50.9 years for sub-Saharan Africa. The crude birth rate (per 1,000 population) was 44 in 1992 and the percentage of women of childbearing age is about 42%. The total fertility rate was 6.0, also at par with 6.3 for sub-Saharan Africa (World Bank, 1994). However, these high fertility rates and birth rates with low contraception use, pose serious threats to the health of the people.

The under five-mortality rate per 1,000 population in 1994 was 131 and a maternal mortality rate of 740 per 100, 000 live births in 1993 (*ibid.*).

The major causes of death and illness in Ghana are parasitic diseases, diarrhoea, upper respiratory infections and accidents (MOH-Ghana, 1995). The World Bank reports that malaria is the single most widespread disease in Ghana, necessitating more than 40% outpatient visits.

In terms of health facility and personnel distribution, most private and public hospitals can be found in the cities and urban areas and the distribution pattern for medical doctors and other health professionals is the same. Public physicians work mainly in hospital and health centres, health posts, and other public facilities are staff typically by nurses and other auxiliary staff (table 1). Only 10% of physicians work in the rural area but about 50% of all physicians are located in the capital city

where only 10% of the population live. The ratio of doctors to population is 1:54,000 and the nurse: population ratio is 1: 3704 (1988-1991).

Table 1: Health personnel distribution by sector

Personnel	Public	Private	NGO	Total
Doctors	611	300	80	991
Nurses	10000	8000	1000	19000
PHC personnel	7000			7000
Paramedics				350
Technicians				1200
Midwives		228		
Total	17611	8528	1080	28541

In 1992 year, there were approximately 800 physicians and 11, 000 nurses working in the public sector, with about 300 physicians working in private practice (Europa, 1999). The total population: bed ratio is 819:1. There are however large regional variations and while the total per bed ratio is 552:1 in Accra, the capital of Ghana, it is 2218:1 in the Upper East region where this study was carried out, an approximately 400% difference. From 1988 to 1991, about 93% of urban population had access to health care compared to only 35% of the rural populace.

In the same year, government health facilities included 49 general hospitals and about 300 rural clinics; religious missions operated 41 hospitals, and 64 clinics, and there was an additional 400 private clinics. The distribution of health facilities in the country is shown in table 2.

Table 2: Type and distribution of health facilities

Facility	Public	Private	NGO	Rural
Teaching	2			
Regional	8			
District	39	152	41	
Military	22			
Polyclinics	8			
Health centres	70			63
Health posts	233			
Clinics	176	402	64	
Community clinics	840			
Training	35			
Maternity		278		
Pharmacies/outlets	3500	359		
Licensed chemical sellers		3077		

The above observations of the low per capita income, the number of people below the poverty line, the low health status of the population coupled with the inequitable distribution of health resources highlight the fact that the basic needs of the vast majority remain unmet. The low per capita income may make access to health services beyond the means of the poor. Malaria also remains the main cause of outpatient attendance and has the effect of further reducing the current health status and productivity of the population.

2.3 Malaria Situation in Ghana

In Ghana, malaria is generally endemic in all areas. *Plasmodium falciparum* is the main parasite, causing severe illness and presenting mainly febrile convulsions and

severe anaemia. Malaria occurs all year round in the country with the peak transmission between June and October (Binka *et al.* 1994).

It is one of the major causes of morbidity and mortality in children (Ghana Health Assessment Project Team, 1981, Ministry of Health, 1992). It also remains the most important contributor to the number of "healthy days lost" (GHAT, 1981). It accounted for 40 percent of all outpatient visits from 1985 to 1987 (MOH-Ghana, 1993). In the 1992 annual Ministry of Health report, malaria remained the leading cause of outpatients' attendance and inpatient admissions, and the second most common cause of death nationally (MOH-Ghana, 1993).

The Upper East Region of Ghana, which has the Bolgatanga district as its regional capital, is an area of high infant and child mortality and harsh environmental conditions, typical of much of the Guinea Savannah belt of West Africa (Binka *et al.*1996). Colbourne and Wright (1955) described the malaria situation of the area as highly endemic with little seasonal variation. The same study found that, malaria parasitaemia was nearly universal by the second year of life, and remained over 90% up to the age of 15 years.

The tables below show the top common diseases (table 3) and leading cause of hospital admission and deaths (table 4) in the Bolgatanga district.

Malaria is the main cause of hospital admissions in the region and represents 58.8% in the Bolgatanga district. It is also the second cause of deaths in the region and district after anaemia.

Table 3: Top Ten Most Common Diseases in the Bolgatanga District (1995)

No.	Disease	Reported Cases	Percentage
1.	Malaria	13,437	58.8
2.	Acute Respiratory Infection (ARI)	1,761	11.9
3.	Diarrhoea diseases	648	4.4
4.	Skin diseases	1592	10.7
5.	Gastro Intestinal Track Infection (GIT)	537	3.6
6.	Urinary Tract Infection (UTI)	462	3.1
7.	Accidents (Fractures and Burns)	408	2.8
8.	Hypertension/Heart diseases	298	2.0
9.	Gynaecological disorders	208	1.4
10.	Snake bites and minor Trauma	199	1.3
	Total		100

Source: District Health Management Team-MOH, Bolgatanga District, 1995

Table 4: Causes of Hospital Admission and Death in the Bolgatanga District -1995

Disease	Admission (%)	Death (%)
Malaria	15.4	4.8
Cholera/typhoid	5.6	2.0
Diarrheoa	2.3	2.3
Pneumonia	3.0	2.3
Hernia	4.3	0
Other	69.4	88.6

Source: Regional Health Administration-Upper East Region-1995

2.4 Strategies for Malaria Control

A number of strategies have been employed to control malaria in Ghana. As far back as the 1940s, some attempts at controlling malaria consisted of antilarval operations and house to house spraying with insecticides containing mainly pyrethrum. These operations, which were carried out in those years, resulted in significant reductions in vector populations and consequently the incidence of malaria.

In 1959, a national malaria unit was set up in the country as a collaborative project between Ghana, WHO and UNICEF. A number of attempts including the use of chemoprophylaxis, vector control and environmental management have been made since then to control mosquitoes with very little or minimal success. In 1982, a national mosquito control programme was launched to carry out another attempt at malaria control through house spraying. A study by Gardiner (1984) in the rural and urban areas of southern Ghana showed that most members of the rural communities did not apply personal anti-mosquito measures. However in the urban settings, 49% used either mosquito coils or spray daily, 32% used these measures occasionally and 9% used ordinary mosquito nets at night. Regular use of antimalarial drugs for prophylactic purposes was also found to be a common practice in urban areas. From 1961-1968, Ghana with the support of WHO, started preparations for a malaria eradication programme (MOH, 1962). This programme was however stopped in view of the technical difficulties in achieving a breakthrough with malaria control as a result of the development of DDT resistance in anophline mosquitoes on a

global scale. Since1968, there has been no official policy on malaria control in Ghana.

The unofficial policy on malaria control in Ghana has been chloroquine treatment for presumptive malaria in health facilities, although self-treatment by the population is common (Brown, 1998).

A global malaria control strategy to reduce mortality and morbidity of malaria disease was adopted at the conference of malaria in Amsterdam in 1992. The major strategies has been to promote early diagnosis and prompt treatment; to implement selective, sustainable, preventive measures, including vector control and to improve early detection, containment or prevention of epidemics (WHO, 1993). The main challenges however, to this new strategy of malaria control is the resistance of the malaria parasite to chloroquine, resistance of the mosquito to DDT, poor coverage and lack of trained personnel.

The strengths and weaknesses of each strategy of malaria control is discussed in the following subsections.

2.4.1 Treatment

The emergence of chloroquine resistance in Ghana and globally threatens the effectiveness of the policy of treating malaria with Chloroquine (Neequaye *et al.*, 1988; Ofori-Adjei *et al.*, 1988; Akanmori *et al.*, 1989). This is accelerated by non-

compliance with recommended treatment dosage and duration by patients (Afari *et al* 1992).

In a national survey on chloroquine resistance with a sample of 626 children aged 6-15 years in Ghana, 570 (91.1%) showed sensitivity to chloroquine and 56 (8.9%) children were classified as resistant to chloroquine: RI (5.1%) and RII (3.8%). The resistance responses was prevalent (17.1-22.7%) in the coastal zone, followed by the savannah zone (8.6-10.0%), and was lowest in the forest zone with (3.1-6.3%). There was no RIII resistance in any of the zones. The table below shows a summary table of chloroquine resistance in Ghana.

Table 5: Chloroquine Resistance By Ecological Zones in Ghana

Coastal	1988	19.4	RI/RII
Savannah	1992	17.1-22.7	RI/RII
Forest	1988 1992	17.0-23.0 3.1-6.3	RI/RII RI/RII
Northern Savannah	1992	8.6-10.0	RI/RII

Source: Afari et al. (1989)

Malaria control programmes are expected to give priority to providing early diagnosis and treatment service to ensure that clinical episodes especially in children receive the correct regimen of an appropriate drug in line with the national malaria drug policy, but increasing resistance, non-compliance and inaccessibility of health care facilities to large populations in the rural areas, clearly indicate that,

while prompt diagnoses and early treatment are important, alternative approaches to malaria control are very necessary.

2.4.2 Vaccines

Vaccination is an exceptionally attractive strategy for preventing and controlling malaria. Much research currently in the world has therefore focused on developing effective malaria vaccines. Experimental vaccination with irradiated sporozoites can protect human beings against malaria, thus suggesting that immunization with appropriate sporozoite and liver-stage antigens can prevent infection in individuals bitten by malaria-infected mosquitoes (Oak *et al*, 1991).

Repeated natural infections with malaria parasites can also induce immune responses that can prevent disease and death in infected individuals, and the administration of serum antibodies obtained from repeatedly infected individuals can control malaria infections in children who have not yet acquired protective immunity (*ibid.*).

Lastly, experimental evidence shows that immunization with sexual-stage antigens can generate an immune response that prevents parasite development in the vector, offering a strategy for interrupting malaria transmission (*ibid.*).

Despite the attractiveness of vaccines, there remain a number of obstacles to its development. Human malaria parasites cannot be readily cultured in vitro with the exception of the erythrocytic (blood) stages of *Plasmodium falciparum*, thus

limiting the ability of researchers to study other stages of this parasite and all stages of the other human malaria parasite species.

Secondly, in vitro assays potentially useful for screening candidate vaccines for effectiveness, do not consistently predict the level of protective immunity seen in vivo. The impact of this is that, vaccines for malaria control may not be available for a decade to come (Oak *et al, 1*991).

2.4.3 Vector Control

The most commonly used vector control of malaria such as the application of insecticides and occasionally through environmental management and biological control, have been successful in some settings but these approaches have had several drawbacks including problems such as insecticide resistance, operational and technical problems and a large human resource component and more importantly the cost of implementation (Chavasse *et al.*, 1999).

The main vector control approach in the past has been indoor residual house spraying but the development of mosquito resistance to some insecticides has reduced significantly their impact on malaria.

The larviciding approach faces the same problem of resistance and it is not feasible in many areas due to the scattered nature of vector breeding sites. Biological control using mosquito larvae predators, such as fish, are also only applicable in a minority of ecological situations and the application of biological insecticides such as

Bacillus thurigiensis suffer the same operational short comings as larviciding with chemicals *(ibid.)*.

These obstacles require new approaches to vector control, which are less reliant on technical expertise, a large work force, specialised equipment and wide spread application of chemicals, need to be explored and utilised. Insecticide treated nets seem to offer a cost-effective alternative to the vector control programmes outlined above *(ibid.)*.

2.4.3.1 Insecticide Treated Nets (ITNs)

Mosquito nets as a preventive measure against mosquitoes is not a new approach. Mosquito nets have been used for many centuries with the earliest one said to have been documented in the Middle East in the 6th century. Mosquito nets have also been used in other Africa countries, for example in the Gambia the high net usage is associated with a high socio-cultural values for nets (Aikins *et al.*, 1994).
Early studies suggested that untreated nets provide some protection against mosquito bites and hence malaria (Bradley *et al.* 1986).

Treatment of nets was introduced mainly to improve the effectiveness of nets in reducing nuisance biting. Nets were first treated with residual insecticides such as DDT during World War II. In the late 1970s, with the discovery of synthetic pyrethroid insecticides, which have low toxicity in humans but produce rapid insecticidal and repellent effects on mosquitoes, widespread treatment of mosquito nets became a practical proposition. Pyrethroids have been found to be safe and

effective and hence the choice for treating mosquito nets and other net materials and some times cotton material.

Sleeping under nets treated with insecticide have been proven to provide greater personal protection of about 24% compared with untreated nets. In large randomized control trials in endemic countries, ITNs have shown reductions in clinical episodes of malaria, high-density parasitaemias, incidence and prevalence of malaria as well as mortality in children. For example, in the Gambia study, ITNs were said to reduce all cause mortality in children 1-4 years by 63% (Alonso *et al.*, 1991). A similar study in Ghana showed a 17% reduction in all cause mortality in children under five (Binka *et al.* 1996). The tables below show the impact of ITNs on morbidity and mortality in children in the African trials as discussed above.

Table 6: The Impact of Insecticide Treated Mosquito Nets on Malaria Morbidity in African Children: Overview of selected trials

Country	Morbidity Reduction (%)	Source
The Gambia	45	Snow et al. (1987)
The Gambia	63	Snow et al (1988)
Kenya	30	Sexton et al (1990)
Kenya	40	Beach et al (1993)
The Gambia	45	Alonso et al (1993)
Guinea Bissau	29	Jaenson et al (1994)
Sierra Leone	49	Marbiah (1995)
Tanzania	55	Premji et al. (1995)
Kenya	44	Nevill et al (1996)

Table 7: Impact of Insecticide Treated Mosquito Nets on Malaria Mortality in African Children (Published Trials)

Country	Transmission Pressure[1]	Coverage[3]	Mortality reduction (P_{ej})[2]	Source
The Gambia	1-10 (S)	High	63	Alonso et al. (1991)
The Gambia	1-10 (S)	Medium	25	d'Alessandro et al. (1995)
Kenya	10-30 (S)	High	33	Neville et al (1996)
Ghana	100-300 (S)	High	17	Binka et al (1996)
Burkina Faso	300-500 (P)	High	14	Habluetzel (1997)

[1] Entomologic inoculation rate (number of infective bites per person per year), seasonality indicated in brackets: P, perennial; S, seasonal

[2] Protective efficacy against all causes of child mortality

[3] Avreage net use by target group

(Source: Adapted from Lengeler et al., 1997)

The use of ITNs however, have problems such as potential resistance of mosquitoes to the insecticide in the future, having nets retreated when is necessary and the need for people to sleep under nets during the dry season when mosquitoes are few are all constraints to the use of ITNs effectively. Another problem of the effectiveness of insecticide treated nets is compliance with washing practices. The effectiveness of the insecticide reduces if nets are washed frequently but people wash nets as soon as they are dirty and this could threaten the effectiveness of the insecticide on the net. Another issue of concern is the sustainability of ITNs in large rural areas. People's willingness and ability to pay for ITNs will determine if ITNs will remain an effective tool for malaria control and this study discusses that.

Chapter 3

CONCEPTUAL FRAMEWORK

3.1 Willingness to pay concept (WTP)

Willingness to pay is a term that is central to the debate about health finance reforms in developing countries. It is closely associated with the World Bank's proposal to shift the finance of curative care from the public to the private sector. The argument put forward by the proponents state that; individuals are generally willing and able to pay for direct care with obvious benefits to themselves and families. Those who have sufficient income to do so should be made to pay for these services and this would increase public resources available for other types of services which are 'public goods' (World Bank, 1994). The problem however, is that no distinction has been made between 'willingness' and 'ability to pay'. Willingness to pay for a health service or care does not necessary lead to actual demand for the service since actual demand depends on the ability of the consumer to pay. Willingness to pay for a health service is affected by a range of factors including people's perception of a disease, the availability and accessibility of the service, the quality of the service, current use of the service and the availability of other alternative services and peoples priorities for expenditure.

That apart, people may be willing to pay for services in general but may not be willing to pay for specific services. Ability to pay for health service on the other hand depends on the availability of cash and the affordability of the health service. People may state that they are willing to pay for a service but may not have the cash at the time the service is available or may not have any money at all to pay. In some cases, people may also be able to pay for health services but would be sacrificing other basic necessities (food, water, and education) which equally play important roles in the overall production of health. It may not be socially or morally acceptable for someone to pay an amount that will be ruineous to themselves or their families even if the person is willing to pay for it. Health services are just one of the factors of production of health.

Despite the controversy over the two concepts, the willingness to pay concept has been applied to pure public goods (water fluoridation) and quasi-public goods (immunisation, insecticide treated bed nets) that are financed by taxes and other government and donor funds, as well as to private goods (curative care) for which people might pay-out-of-pocket. It is the demand curve for health care that shows the negative relationship between the price of health care or services and the quantity demanded (Weaver *et al.*, 1998). Willingness to pay estimates provide valuable information about the relationship between the price, the number of people who will participate in a programme or intervention and revenue to be generated from such a programme. The method commonly used to assess willingness to pay is the contingent valuation approach.

3.2 Contingent valuation (CV) measure of willingness to pay

The contingent valuation method (CV) is a survey research method that asks people hypothetical questions about their willingness to pay for a particular programme or intervention. It assumes that respondents have had no previous experience of buying or using the health service or product that is going to be put on the market and instead asks people their willingness to pay on the basis of their expectations (Russell *et al.*, 1995). This may be likened to the principal-agency theory where the patient or consumer of health care usually does not often know or have information for example on the cause of the illness, nor appropriate treatment or preventive measure and relies solely on the agent (health care provider) to provide this information for him/her to make an informed decision based on his/her expectations. Since the health service and the circumstances under which the service or good is bought are hypothetical, the respondent must develop an answer based on the information or scenario provided by the interviewer, which is very critical if valid responses are to be obtained. Even though there is asymmetry information about the nature of the health care commodity, the CV method is consistent with the social welfare theory as consumers are presumed to know the benefits and cost of what they choose to pay to maximise their welfare.

It has been argued that the most obvious area in which to use the CV method in the health care sector is prevention since prevention concerns risk and involves decisions that individuals have to make in everyday life; e.g. choice between the use of an insecticide treated bed net against mosquito bites or not (Magnus et al., 1991).

The CV method has mainly been developed in the area of valuing environmental benefits. The first to use this approach, was Davis in trying to tease out the value of a recreational area. A number of studies using CV methods appeared in the 1970s. It was used to value the amenities of public parks in Chicago by Darlings and reduction of risk from mobile coronary care units by Acton. It has also been used to value increased water quality, air visibility and it is now the most commonly method of valuing environmental benefits (Magnus et al., 1991).

The CV method has also been used in health economics to measure the value of Hypertentive therapy (Johannesson *et al.*, 1991), in vitro fertilization and water services (Neumann *et al.*, 1994; Whittington *et al.*, 1990; Whittington *et al.*, 1992). In developing countries, it has been used to assess willingness to pay for different health states and prevention programmes of schistosomiasis (Kirigia et al., 1997). In health economics, the method has mainly been used to measure willingness to pay for new products or procedures.

The design of the scenario of CV studies is very critical in the design of willingness to pay surveys if strategic bias found in CV studies are to be avoided. A good scenario from the literature includes adequate information on the good, its effectiveness, side effects, alternatives/ complements to the intervention and benefits of the intervention (Weaver *et al.*, 1998).

3.2.1 Bidding game technique

The contingent valuation questions are divided into open-ended and discrete valuation questions. Open-ended questions usually allow the interviewer to obtain more information on the subject than discrete questions that only produce 'yes' or 'no' answers. This study utilised the open-ended valuation questions where respondents were asked to state their maximum willingness to pay for the service. The technique used was the bidding game.

The bidding game resembles an auction where a first bid is made to the respondent, who accepts or rejects it, and then the bid is raised or lowered depending on the answer. The process goes on until the respondent's maximum willingness to pay is reached.

The bidding game technique has been used extensively by Whittington *et al.* (1987; 1988; 1989; 1990) in the water sector. Russell (1994) also used the bidding game format to test WTP for antenatal, delivery and post-natal package for a non-profit-making hospital in Mexico.

This technique was seen as appropriate for this study because the majority of the respondents could not read, and due to the Ghanaian culture of bargaining for items.

Some studies of willingness to pay have assessed WTP for bed nets by looking at the availability and use of mosquito control products, knowledge and causes of malaria. It has been argued that the availability and use of other mosquito control products in an area may show potential willingness to buy nets as compared to the non-existent of use of preventive measures. It is also stated that, it is a better measure of potential demand for insecticide treated nets than by eliciting for maximum WTP in surveys, that may not reflect actual demand for insecticide treated nets. However, studies that seek to assess WTP to pay by looking at the availability and use malaria control measures may be feasible in areas where use and access to preventive control measures are available. However, in most large rural African populations where ever use of mosquito control products is negligible, relying on the ever use of preventive measures to assess potential demand for insecticide treated nets may be a problem. In addition to eliciting maximum WTP pay values for health services, this study would try to find out; what are the complex factors which influence household behaviour, expenditure priorities, the impact of increasing health care expenditure on household budget, on their livelihoods and the production of health in general which all play a role in people's willingness to pay for services but have not been addressed in most WTP studies.

3.2.2 Potential bias in contingent valuation studies

Bias may result from the way contingent valuation questions are asked. Carson (1989) outlined various potential biases in CV studies including scenario mis-specification,

strategic bias, interviewer bias, starting point bias and many others. Strategic bias results when the respondent gives a WTP that does not represent his/her true WTP in an attempt to influence the provision of the good.

Social desirability bias also results when respondents provide answers designed to make them look good to the interviewer. Evidence however suggests that strategic response exist more in theory than in practice (Brookshire. *et al.*; 1982)

3.3 Concept of Ability to pay (ATP)

The affordability of health care has become a critical policy issue in developing countries as households are to make out-of-pocket contributions to their health care and other fees for services such as water and education. Research and policy debates have focused on willingness to pay for health care essentially and have assumed that willingness to pay is synonymous with ability pay, but willingness to pay may not reflect ATP. Household expenditures on health could force them to cut down on essential or basic necessities such as food and education to meet health care expenditure and the opportunity cost of payment (food, education) make the health care unaffordable (Russell, 1996).

Previous studies have looked at health expenditure and utilisation to determine if health care was affordable but other complex factors such as financial constraints, accessibility, availability of other providers and quality of care which all play a role in the demand for health care have tended not to be an issue (*ibid.*). This study would address ability to pay by looking at household income and expenditure.

Cash income is said not to be the only source of income and determinant of ability to pay for health care or services. Households have other potential resources such as assets, education and their ability to mobilise resources in the face of a sudden contingency are all potential resources to them. Ability to pay has therefore been measured in other studies by looking at coping strategies households use to gather resources for their needs, possession of assets such as houses and type of house, bicycles, radios, livestock, land and other local indicators of the socio-economic status of households.

The disaggregation of household potential resources is also central to the debate on ability to pay since it shows the different resources and potential strategies available to the individual, household and occupational groups (Russell 1996).

The use of income as a determinant of ability to pay is often difficult to measure as income may be overestimated or underestimated and other potential sources of income might not be disclosed. The use of household consumption expenditure has been said to be a more reliable indicator than current income. Friedman (1957) shows that consumption is a better measure because it is more stable and transitory current income may bias the relationship between behaviour and income towards zero.

Expenditure has been found to also have practical advantages. Subjects are more often willing to provide information about expenditure than income and in many cultures where the household head does not share salary and revenue information with spouses, the spouse who does much of the shopping can provide good information on expenditures

(Weaver et al 1996). In addition to collecting information on the variables above, this study will focus on the household where decisions on how to allocate limited resources to health, education and other essential commodities may have serious consequences for the household and individuals within it.

3.4. Demand model

Households make decisions that affect their everyday life and these decisions are dependent on the satisfaction they derive from making such decisions. The choice for a particular type of health care or service such as an insecticide treated bed net (ITNs) at the expense of some other type of household consumption or health service is dependent on the utility the household is expected to derive from the use of ITNs. The demand for health is a derived demand and health is demanded not just for its own sake but to enable households to for example, participate in the labour market (Wagstaff, 1982). Health can be demanded as a consumption commodity (for the good of being healthy) and in this case, it enters the utility function directly. On the other hand, health may be demanded as an investment commodity (to increase the amount of time available to engage income-earning activities and for leisure) and in this case, enters the utility function indirectly. ITNs are just one of the inputs in the production of health and may demanded because nets provide good sleep at night by preventing mosquito bites and nuisance or to prevent one getting malaria which could reduce the time available to engage in the labour market.

The household maximises its utility by consuming health services and composite of other goods and services. Economic theory postulates that, the individual or household will make a choice to buy an ITN if the utility to be derived from using it, is greater than the next available alternative health service or consumption given the household's budget constraint.

The households utility function can therefore be expressed as a function of health service (insecticide treated nets) and other consumption commodities

$U_i = U_i(h, x)$ ..... (1)

Where U_i = the utility that household i is expected to derive from the use of an insecticide treated bed net and X, a vector of factors such as socio-economic, demographic and health characteristics.

The outcomes predicted as a result of this maximisation process are that a household's decision to buy and use an insecticide treated bed net will be determined by price of ITNs, availability of other mosquito control products, prices of these alternatives (coils, spray, window screens), plus a set of socio-economic, demographic, and health factors. In general terms, the relationship between insecticide treated nets and the exogenous factors is as follows.

$Y = f(P_1, P_2, Z_i)$ ..... (2)

Y= willingness to pay for insecticide treated nets

P_1= price or cost of buying insecticide treated nets

P_2= prices of other mosquito control products or services

Z_i= The set of household, health and demographic characteristics (income or expenditure, assets, education, incidence of malaria, area of residence, occupation, household size, age, sex, ages of children, reasons for non-use of nets)

In the process of modeling, the following assumptions were made:

1. Household preferences are consistent and transitive.
2. Households prefer more ITNs to less number of insecticide bed nets but wanting more nets will only apply up to a limit.

3.4.1 Estimation Method

Three structural equations describe the demand for insecticide treated nets. In the absence of an explicit utility function, there is no unique structural equations and a linear specification is employed.

(1) The WANTNET1 Equation

The logit regression would establish if there exists any desire among households to buy ITNs or the probability of households willing to pay for ITNs.

Logit Model

The logit model is described as

$$P(Z=1) = \frac{1}{1 + e^{-Z}}$$

Where P(Z=1)= 1 if the household is willing to buy an insecticide treated net and 0 if it is not.

The log of odds of the probability that a household would purchase an insecticide treated net is written in the log form as

$$L_i = \ln\left[\frac{P_i}{1 - P_i}\right] = Zi \quad \ldots\ldots(3)$$

L_i (logit) = log of the odds

P_i = probability of owning an ITN

$1 - P_i$ = probability of not owning an ITN

$$Z_i = \beta_0 + \beta_1 \text{ totyinc} + \beta_2 \text{ maxwtp} + \beta_3 \text{ nnet} + \beta_4 \text{childold}$$
$$+ \beta_5 \text{causepua} + \beta_6 \text{ pua} + \beta_7 \text{ educ1} + \beta_8 \text{ ownet1} + \beta_9 \text{ hhsize}$$
$$\beta_{10} \text{ childd04} + \beta_{11} \text{ costnet} + \beta_{12} \text{ notown1} + \beta_{13} \text{ numnet}$$
$$+ \beta_{14} \text{ costcoil} + \beta_{15} \text{ cospray} + e_i$$

The Coefficients (βs) of the logit model measure the change in L for a unit change in Z (vector of explanatory variables). It tells how the log-odds in favour of buying an insecticide treated nets changes with for example a unit change in the price of other mosquito control products, income and so on (Description of variables in appendix III).

(2) The MAXWTP Equation

This regression will be used to determine the factors that influence the amounts of money households expressed to pay for one insecticide treated bed net in the survey and whether they are different from the factors that determine households desire to own insecticide treated bed nets in the logit model.

$$\textbf{Maxwtp}_i = \beta_0 + \beta_1 \text{ totyinc} + \beta_2 \text{ paymecha} + \beta_3 \text{ nnet} + \beta_4 \text{ causepua}$$
$$+ \beta_5 \text{ educ1} + \beta_6 \text{ ownet1} + \beta_7 \text{ hhsize} + \beta_8 \text{ childd04}$$
$$+ \beta_9 \text{ costnet} + \beta_{10} \text{ costcoil} + \beta_{11} \text{ cospray} + \beta_{12} \text{ cosother}$$
$$+ \beta_{13} \text{ radio} + \beta_{14} \text{ wantnet1} + \beta_{15} \text{ notown1} + \beta_{16} \text{ numill}$$
$$+ \beta_{17} \text{ numnet} + e_i \quad \text{.....(4)}$$

(3) The NNET Equation

This second OLS regression is aimed at finding the factors that determine the number of nets households are willing to buy and if there would be any difference with regards to the factors that influence maximum willingness to pay.

$$\mathbf{Nnet}_i = \beta_0 + \beta_1 urbrur + \beta_2 totyinc + \beta_3 paymecha + \beta_4 kindcash + \beta_5 hhsize + \beta_6 malacost + \beta_7 gender1 + \beta_8 educ1 + \beta_9 childd04 + \beta_{10} costnet + \beta_{11} costcoil + \beta_{12} maxwtp + \beta_{13} cospra + \beta_{14} cosother + \beta_{15} radio + \beta_{16} numill + \beta_{17} notown1 + e_i \quad \ldots\ldots(5)$$

e_i= is the error term assumed to be normally distributed

The βs in the OLS regression measure the change in the mean values of MAXWTP and NNET per unit change in the explanatory variables.

$WANTNET1_i$, $MAXWTP_i$ and $NNET_i$ are the dependent variables. Definitions of the variables are in appendix III.

Table 8: Definition of Variables

Definition of Variables	
Dependent Variables	**Variable Descriptions**
WANTNET1	Respondent wants to buy a net=1 Otherwise=0
MAXPRICE	Maximum price respondent is willing to pay
NNET	Number of nets respondent wants to buy
OWNET1	household has untreated net = 1 dummy Otherwise=0
Explanatory Variables	
URBRUR	Urban=1 Otherwise=0
LOGYEAREXP	Log of household consumption expenditure on food
EDUC1	Primary, secondary, tertiary=1 otherwise=0
OCCUPE	Civil service, trader/artisanry=1 Otherwise=0
CURRMAR1	Married=1 Otherwise=0
GENDER1	Female=1 Male=0
CHILDD04	Households with children less than 4 years
EVERUSE	Household has ever used coil, spray, other=1 Otherwise=0
CAUSEPUA	Cause of malaria is the mosquito=1 Otherwise=0
OWNET1	Household has a net=1 Otherwise=0
HHSIZE	Total household size
COSTNET	Cost of untreated nets
COSTCOIL	Cost of coils(repellent)
COSPRAY	Cost of insecticide spray(repellent)
COSOTHER	Cost of other preventive measures
RADIO	Household has a radio
NOTOWN1	Reason for not having net is, expensive, no money, expensive =1 Otherwise=0
REASON	Reason for having net is to prevent mosquitoes biting=I Otherwise=0
NUMILL	Number of households with a member ill prior to the household
NUMNET	Number of nets households have
MALACOST	Cost of treating malaria
PAYMECHA	Mode of payment to used to purchase net is credit or after harvest=1 Otherwise=0

Variable description continued.....	
PUA	If household member was ill with malaria=1 Otherwise=0
KINDCASH	If household received any gift in cash or kind
CHILDOLD	Household with children 5-39 years
TV	Household have TV = 1 dummy Otherwise = 0
BIKE	Household has bicycle=1 dummy Otherwise = 0
UTENSIL	Household uses aluminium/plastic wares=1 dummy Otherwise=0
ZINC ROOF	Household has zinc roof top =1 dummy Otherwise= 0
VEHICLE	Household has television set =1 dummy Otherwise=0
SEW	Household has a sewing machine = 1dummy Otherwise=0
TOILET1	Household uses free range (no toilet facility) = 1 dummy Otherwise=1
TRADL	Household uses lantern=1 dummy Otherwise=0
CPOT	Household uses a coalpot =1 dummy Otherwise =0

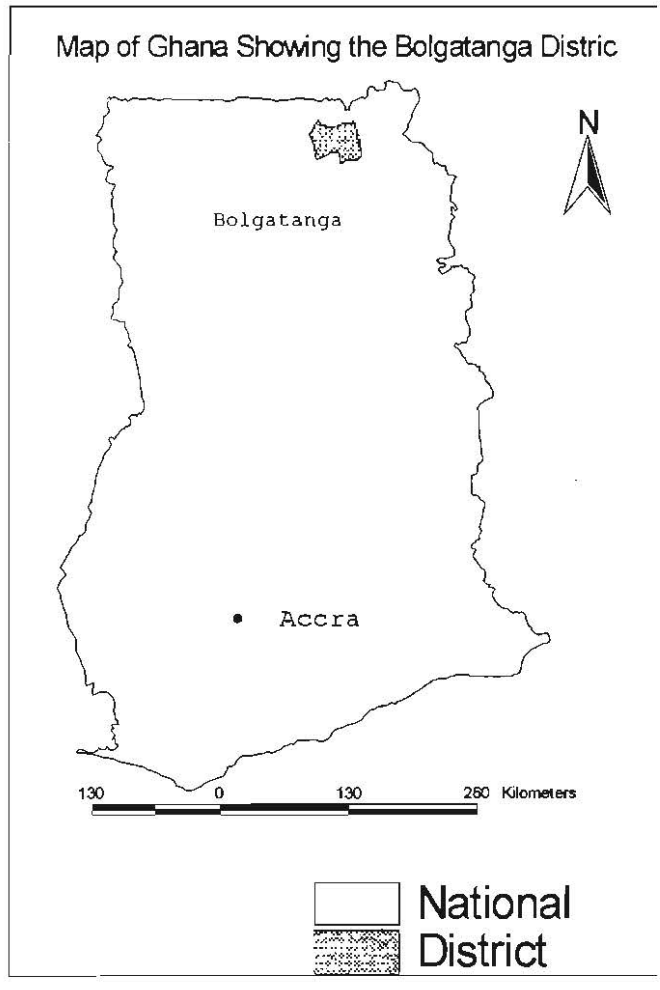
We expect that household head total income, knowledge of causes of malaria, education of household head and households with children 0-4 years will express a positive demand for insecticide treated nets in the models specified above. For example, households with children 0-4 years may want to protect their children who are more vulnerable and have less immunity to fight malaria. One also expects that knowledge of the causes of malaria may show the potential use of insecticide ITNs against mosquito bites and malaria, and consequently influence demand positively. On the other hand, we expect the prices of other mosquito control products to also assume positive signs since they are expected to be substitutes to ITNs.

Following Grossman's argument that the better educated are more efficient producers of health than the uneducated, the sign for education is expected to be negative for household heads that are educated. However, looking at education as a producer of income, the education coefficient may also take on a positive sign. Likewise, since there no effective substitutes for ITNs, the better educated may tend to use ITNs.

The amounts households are WTP for a net is also expected to positively affect the household's desire to use ITNs. Likewise the type of payment mechanism that is possible of spreading out the cost of buying nets, is expected to directly increase the willingness of households to buy ITNs. The cost of treating malaria, the health status of household members and whether households get remittances either in cash or kind from other relatives are all factors expected to have a positive influence on the demand for ITNs. It is however expected that the number of nets households require and the size of the household would all tend to have a negative effect on willingness to buy ITNs. For instance a large household size would need a larger budget to purchase nets as compared to smaller households. It is however expected to be a positive determinant in equation (5), as the number of nets required by the household is related to the size of the household.

Furthermore, the number of nets households already have will similarly have a negative effect on WTP. Factors such as gender, reasons for non-use of nets, and their effects on the demand for insecticide treated nets are yet to be established from the empirical analysis of the data.

Figure 1.


Map of Ghana Showing the Bolgatanga Distric
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Chapter 4

RESEARCH METHODS

4.1 Study area

The study was carried out in the Bolgatanga district of northern Ghana. This district was selected for three reasons. It has more urban dwellers as compared to the other five districts of the region that could have an impact on the study and secondly it was easy for the team of researchers who spoke the language of the district to carry out the research. This district has also not had a formal experience of using insecticide treated nets and was therefore a good site for a hypothetical study of this kind.

The district serves as the administrative capital of the Upper East region of Ghana. It lies between latitudes 10° 30' and 1° 55' North and longitudes 0° 33' and 1° 00 West covering an area of 1, 620 square kilometres. The Bolgatanga district is demarcated into enumeration areas. An enumerated area is made up of a number of villages or settlements. There is however little data available on the number of villages in an enumerated area or the number of people living within an enumerated area. There are on average 2.5 households per compound and 5.1 people per household in the district (Ghana Statistical Services).

There are two main seasons, a wet and a dry season. The mean annual rainfall ranges between 950mm-1,100mm falling mainly between May and October. The annual mean maximum temperatures for the district is about 35°C. Average minimum temperatures are usually lowest in December and January, about 12.8°C (District Assembly 5 Year Medium Term Plan, 1995).

The population of the district was estimated at 328,608 in 1995. The population is predominantly rural; and about 44.7% of the population are under the age of 15. The majority of the population are ethnically *Frafras*, a mixture of other tribes make up the remainder. The main languages spoken are *Gurune, Nabdt* and *Talene*.

The inhabitants are largely subsistence farmers. Settlements are very dispersed in the rural areas and residents farm mainly millet, which is the staple food, rice, groundnuts and vegetables. They also rear goats, sheep, cattle and chicken.

Other economic activities in the district include trading which largely operates in the informal sector, 'galamsey' (small gold mining) and quarrying.

Migration is not uncommon in the district, and during the dry season when there is less farming activities, majority of the population, mostly the illiterate population migrate to the southern part of the country to work in farms and to do petty trading. They usually return during the rainy season to cultivate their fields.

The district is served by the Bolgatanga regional hospital. There are five health centres, two clinics and 67 outreach clinics to serve the district. There are also three private clinics and three mission clinics providing health services to the populations.

4.2 Study design

4.2.1 Sample selection

In order to achieve a desired representative sample, a sample size of 900 was drawn randomly at 95% confidence level with a precision of plus or minus 5. The district has 85% of its population leaving in the rural areas and to get a sample that would resemble the whole configuration of the district, 30% urban and 70% rural, it led to the need to interview 270 households in the urban area and 630 in the rural area.

The urban part of the district has twenty-five enumeration areas and seven enumeration areas were randomly selected using the simple random number table. Because there were seven fieldworkers to be deployed to the urban area, it was decided that the 270 households to be covered in this area be spread over seven enumeration areas (28% of all urban enumeration areas), in order to facilitate the conduct of fieldwork since households are not numbered. The same was done in the rural area. Field workers interviewed thirty-eight and forty-eight households per enumeration area in the urban and rural areas respectively.

It was not possible to get access to the updated compound listing for Bolgatanga district, thus a spatial random method was used to select the households to be interviewed. Each enumerated area was divided into five cardinal points; north, south, east, west and central. These cardinal points were folded up in pieces of paper and tossed. Each fieldworker then selected one of these five points and began the interviews from that point in the selected enumeration area until the number of households that were to be interviewed in that area was reached. The balloting was done repeatedly until all selected enumerated areas were assigned a starting point.

For the qualitative study, four areas were randomly selected in the urban area and six in the rural area out of eighteen and sixteen enumeration areas respectively. Opinion leaders in the selected areas including assemblymen (local political leaders) were requested to invite women and men of the age groups 25-39 and above 40 years for the discussions. In most cases, participants turn out was more than expected, and people within the age groups specified above were asked to stay for the discussion while those who were 40 years and above in the group of 25-39 years were politely asked to go back. This occurred in areas where assemblymen were asked to gather participants. The main reasons cited for this problem was that, as political leaders they did not want to appear biased, so they invited all men and women for the researcher to decide the target age group for the discussion.

4.2.2 Unit of analysis

The unit of analysis in this study is the household. The household is defined as a group of people living together and sharing the same budget on food. People live in compounds in the Bolgatanga district and a compound can usually be made up of a number of households. Interviews were conducted with household heads.

4.2.3 Fieldwork and training

Before the training started, a manual for the training was written up, giving background to the study, the role of the interviewer, and how to enter the community to conduct interviews. This was adapted from the manuals available at the Navrongo Health Research Centre which has been conducting social and clinical research in a nearby district for the past ten years (NHRC, 1989). The manual was written up in consultation with a demographer, an anthropologist, and a social worker who have had adequate knowledge in this area of research.

Training was provided for eleven fieldworkers who have had previous knowledge of conducting interviews and spoke the local languages fluently.

Field workers were trained for three weeks on the details of the questionnaire, how to ask questions appropriately and the translation of the questions into the local language. There were several mock interviews among interviewers and two fieldwork pilot tests.

The first pilot test was conducted after two weeks of training to assess the competence of the interviewers in this particular survey. The last pilot test was conducted after the last week of training. There was a marked improvement in the second pilot test.

4.2.4 Data collection techniques and instruments

A questionnaire was designed to obtain information on knowledge of causes of malaria, health seeking behaviour, socio-economic, demographic and health characteristics of the sample population. The questionnaire included questions on the educational status of household heads, employment status (household heads were asked on all types of activities they engaged in to earn income), incidence of malaria, cost of malaria control, treatment methods and household size.

4.2.4.1 Willingness to pay instrument

The questions on Willingness to Pay (WTP) were hypothetical questions asking respondents directly on their maximum WTP. A study on insecticide treated bed nets was however carried out in a nearby district which is about 30 kilometres from the study site,

and the possibility of some of these nets being used by some households in the study district cannot be avoided.

In order to minimise strategic bias which is said to exist in CV studies, interviewers were trained on how to approach the community, the household head and the type of information to provide to the respondent before interview began. The questionnaire was also designed in such a way that it started with questions on knowledge of the disease, consumption expenditure, income levels, amount spent on other mosquito control products. The scenario was carefully designed to reflect that the respondent was responsible for the payment of the product that was marketed.

The scenario provided the respondent with lay information on the effectiveness of the insecticide treated bed net, the side effects, incidence of malaria and other measures of controlling mosquitoes such as coil and spray (scenario was adopted from Weaver et al 1998). This information was provided to enable the respondent make a true valuation of how much she/he was willing to pay for an insecticide treated bed net. Respondents were shown an insecticide treated net in all interviews.

The bidding game technique that was used in the elicitation process has a potential starting point bias and to minimise this, interviewers were trained to present the scenario to the respondent and allow the respondent to state the amount he/she was willing to pay for the net and then to bid up or down depending on the first bid of the respondent. While this worked in most cases, in a few cases, respondents asked for a first bid from the interviewer. In these cases, interviewers quoted prices in the range of US$10.00-

US$20.00. The respondent's bids were all below the amounts coded by the interviewer and were bid up and down until the maximum willingness to pay was reached.

Willingness to pay was also assessed looking at the perception of mosquitoes as a cause of malaria and other insect nuisance, current use of mosquito control products such as coils, sprays. These factors have been said to possibly indicate demand for insecticide treated nets.

4.2.4.2 Ability to pay questionnaire

In this study, affordability was assessed by asking for past health care expenditure, and household consumption expenditure in the month prior to the survey, income and the possession of certain assets in the household, delayed treatment or abandonment of treatment. Information collected on past health care expenditure included; the type of treatment and facility at which treatment was sought and expenditures for health care in the month prior to the survey for each member of the household who had been ill during that period.

The measure of household consumption expenditure on food included market products and agricultural products consumed in the month prior to the study including information on cash or items received in kind, electricity, water, kerosene, and drinks. These were considered as monthly expenditures that households usually make.

Additional information was collected on occasional expenditures on school fees, clothing and family ceremonies. If households incurred a debt in the month prior to the survey, information was also collected on that. In the analysis however, only expenditure on food, electricity, water, kerosene, transport and expenditures health care and drinks that were thought to be made monthly was included and this was multiplied by twelve months to get a proxy expenditure for the year.

Expenditure on school fees, clothing, family ceremonies (mainly funerals), debt incurred were all excluded in determining expenditures for the year because they are made occasionally and multiplying them out to get a yearly figure may lead to over estimation of household consumption expenditures.

That apart, the data were collected a week after the Christmas and new year festivities and also a period for performing funerals in the district and households made huge expenditures on clothing. School fees are also often paid yearly. Analysis of these data have been made to reflect the percentage of yearly expenditure that is spent on school fees, clothing, repayment of debts and family celebrations for households that incurred these expenses.

Incomes from various activities that the household head engaged in to earn money, such as farming, salary, trading, gambling and all sorts of income generating activities were asked for. Income from various economic activities was solicited for to give a broad picture of the coping strategies that households use to fend for their families. Monthly income was multiplied by twelve to get a proxy income for the year.

Possession of household assets such as zinc roof, bicycle, radio, television set, sewing machine and other electrical gadgets were all asked for in order to see if they had any impact on ability to pay. Other studies have suggested that possession of some of these assets may point to the ability of households to pay for health care or services.

4.2.4.3 Qualitative study guide

A qualitative study was also conducted to complement the survey. Participants of the focus group discussions were of two groups; men and women of ages 25-39 years and the elderly from 40 years and above. These age groups were chosen because they represented the reproductive age group and had had experience of raising children and may have adequate knowledge about malaria. The groups also represented household heads, particularly the male groups and they usually take decisions on health related and other issues in the household.

The average number of participants in each focus group discussion was twelve. The focus group guide contained questions on general health problems in the selected communities, knowledge of causes of malaria, methods of control of malaria household decision making in terms of child health care and purchase of insecticide treated nets.

There was also a ranking exercise that allowed participants to rank various household items such as buckets, basins, bicycle, radio, car and others with the insecticide treated bed net in order of priority if the household had money to buy these items.

This exercise was to give information on the seriousness of malaria as a problem in the communities, its priority among households and the potential use of insecticide treated nets as a preventive measure.

In all, ten focus group sessions were held; four in the urban area and six in the rural area. Each group session lasted about one hour and twenty minutes.

Interviews were tape recorded and later on transcribed by people who had adequate knowledge of the local language. Notes on important issues discussed were taken in addition to tape-recording.

4.3 Quality control and data management

Completed interviews were first checked by a field supervisor for errors and inconsistencies as forms came in from the field. The completed forms were then re-checked by the researcher to ensure the quality of data that was coming in from the field. Quality control checks were also done where some of the questionnaires were randomly selected and the selected households revisited to make sure interviews have actually been conducted in the appropriate areas and in the appropriate households.

Questions were pre-coded and screens for data entry were designed by the programmers in the computer laboratory of the Navrongo Health Research Centre, using the software foxpro2.6. The forms were put into batches and given form numbers to avoid loss of data. Data were rechecked after data entry to correct errors that might have occurred in the data entry process.

4.4 Techniques of data analysis

Cross tabulations, graphs, frequencies, ordinary least squares and logit regressions were used to analysed the data using the STATA software package.

Chapter 5

RESULTS AND FINDINGS

A broad overview of the results and findings is presented in this chapter. The discussion section presents more details and policy implications of the findings.

5.1 Baseline characteristics of study population

Approximately 876 respondents out of a total of 900 households were successfully interviewed in the survey. There were on average 5.6 people per household. The study area is predominantly patriarchal, thus 66% of the households were headed by men. Women household heads were mainly found in the town and a greater percentage were widows. About 68% of respondents have had no formal education while out of the 32 % that have had formal education, 19% have had only primary education.

Respondents were mainly farmers and traders. The formal sector workers represented only 9% of the population. Respondents engaged in various activities including trading, farming, gambling (lotto) and various forms of other activities to earn income. Eighty-one percent of the population are farmers and 30% of the sample population engaged in more than two income earning activities.

5.2. Knowledge of causes of malaria

Knowledge of the causes of malaria was found to be very high among urban dwellers as compared to the rural population. About 89% of urban and 63% of rural respondents attributed the cause of malaria to the bite of the mosquito. There were other causes attributed to malaria such as eating very sweet foods, houseflies, cold, wind and swamps. Respondents also identified factors such unclean surroundings and overgrowth of weeds as the breeding places of mosquitoes. Studies in the Gambia, and Sierra Leone reported similar findings (Aikins et al 1994).

Major symptoms of malaria were perceived as headache, fever ('hot body'), vomiting (yellowish/greenish), chills and loss of appetite.

Malaria was said to be very common in the rainy season because of the high density of mosquitoes. Many also attributed malaria to be common during this period because people work very hard in the fields and there is less food to feed on, thus making them more susceptible to malaria. Even mothers consider malaria to be prevalent in the rainy season in the focus group discussions. A study by Winch (1994) in the Bayamoyo district of Tanzania found out that mosquitoes and diseases thought to be caused by mosquitoes were said to be extremely uncommon in the hot dry season, implying that malaria was only common in the rainy which is consistent with findings from this study.

Participants also strongly believed that the mosquito is not the only cause of malaria. For instance, other measures often used to prevent the child from getting malaria were to pre-heat food, and make sure they do not eat very sweet foods.

During the focus group discussions, cerebral malaria presenting in the form of convulsions known commonly as '*ninga,*' in the local language could not be linked to malaria (it is believed that convulsion occurs when a particular type of bird flies over the child). Participants tended to say that, " There is one serious disease whose attacks make the child become unconscious and stretches out and the adult talks like a mad person". Similar studies by Mwnesi (1994) reported that few mothers in the Kilifi district could associate convulsion to malaria .Convulsion is rather assigned a spiritual reason and when the child is rushed to the hospital at the last minute, hospitals are blamed for their inability to treat this disease. Consequently, cases of convulsion and severe malaria are continuously treated at traditional healers' homes. The acute mental changes associated with cerebral malaria lead many to believe that it is due to supernatural causes rather than natural causes.

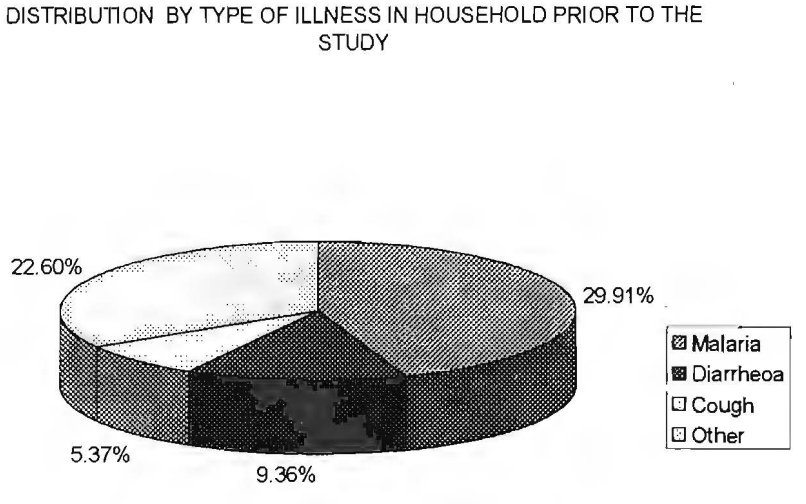
Cerebral malaria though seen to be dangerous, is not thought to be controllable through vector control or chemotherapy. In addition, non-cerebral malaria is often not taken very serious and treated often by self- medication.

Knowledge of the causes of malaria and its consequences seem to affect health care seeking behaviour and utilisation of overall health services.

5.3 Health care seeking behaviour of households

About 57% of the households in the survey had at least one family member sick a month prior to the survey. Approximately, 29% of disease was attributed to malaria, 19% cough, 7% diarrhoea and 22% was attributed to other causes such as accidents and stomachache. The figure below shows a graphical representation of disease distribution in the month prior to the survey.

Figure 2:



Fifty-three percent of household members who were ill sought treatment at various health facilities. The most preferred facility for treatment was public hospitals. The main reason for use of public hospitals was the perceived quality of care and the fact that it was also less expensive compared to the private facility.

Respondents in the rural areas however believed both public and private hospitals provided quality health care but the choice of provider was influenced by accessibility. However, the choice of drug peddlers was two fold; they are less expensive and within reach.

Self-treatment was very common. It is usually the first line of treatment before respondents seek hospital treatment. The rural population relied mostly on drug peddlers. Other local methods found to be very common in the treatment of malaria included the use of the stock of boiled '*nim*' leaves, guava, pawpaw and herbs. These leaves are boiled together and the stock is used as medicine. The sick person is then allowed to sit in the steam of the hot stock , completely covered with a blanket or cloth. It is believed that, the bitterness of the stock and steam will 'squeeze' out the malaria. This is usually done for several days.

For children, mothers tended to buy chloroquine syrup and paracetamol from drug peddlers which they administer when the child has 'hotbody' (runs a temperature).
The hospital is often the last resort. Various reasons including distance to health facilities in the rural areas and the cost of treatment at the hospitals prevented people from seeking immediate treatment for malaria.

Although respondents recognised that the quality of treatment received from drug peddlers was poor, it was often less expensive. In other studies, it has been reported that private drug sellers and peddlers do not often give the recommended dosage but sell drugs on the basis of the amount the patient was able to pay. A respondent in a focus group discussion confirmed this.

R1: If your child is sick and you have some money, you send him to the hospital. On the other hand, if you have no money and you have up to 600.00 cedis (USD 0.25), you go to the drug store to buy medicine.

The ineffectiveness of self-treatment reported by respondents has serious consequences for patients such as repeated attacks of the disease and resistance to treatment. However, drug peddlers are seen as doctors in the perspective of clients. Respondents stated that drug peddlers know the signs and symptoms of malaria and what they often prescribe for them was not different from what was prescribed at the hospitals for malaria.

The cost recovery program has also had its toll on the health-seeking behaviour of the population. The hospital is seen as a last resort. Participants lamented that the hospital does not treat on credit and herbs are therefore used as first aid while they look for money to take the child or person to the hospital. Some respondents in a focus group discussion had this to say on this issue.

Most of us are farmers and traders but business is no more going on well, so there is no money for important things like the bed net. This is why some of us lose our children. There is no money to send them to the hospital and we are relying on herbs and leaves like the 'nim' while the actual help is in the hospital (female respondent).

.....You cannot get services on credit. Sometime ago, a child was attacked by 'ninga' (convulsion). The mother did not even have money for transport to send him to hospital, so I had to give her money for transport. On reaching the hospital, she had to rush back for money and the child died without attention (female respondent).

People get admitted to the hospital and when they get well, they run away without paying their bills. This is because of poverty.

The implication of this finding is that malaria may remain a problem for a very long time to come in rural populations if people do not seek prompt treatment or use preventive measures. Delayed treatment only leads to high medical bills which become unaffordable to the majority of the population.

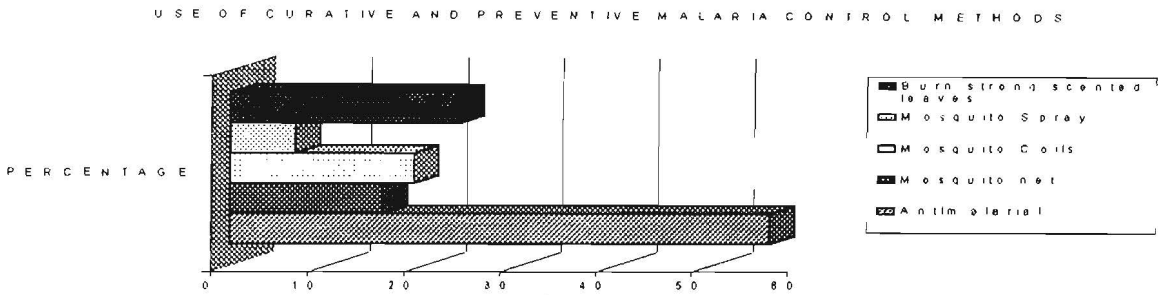
The use of insecticide treated nets regularly reduces malaria morbidity and mortality in children and the promotion of the use of these nets may reduce the incidence of malaria in the family and the cost of treating these episodes of malaria.

5.4 Use of nets as a preventive measure

The habit of using modern methods of preventing mosquito bites was only prominent among urban populations. Methods available included mosquito coils, spray and screens. About 17% of the sample population currently own and use untreated mosquito nets. Nineteen percent of respondents use mosquito coils and 7% used mosquito spray to prevent mosquito bites.

This is consistent with that which was reported by Gardener in the 1984. Figure 3 illustrates the percentage of people who use malaria control products.

Figure 3:



Other methods used mainly by the rural population included burning of strong scented leaves, groundnut shells, sheanut shells and various types of strong scented leaves. These are burnt at night to drive away the mosquitoes temporarily. These methods were described as ineffective and have other disadvantages such as leaving rooms smoky and black in colour and producing bad odour in clothing. Burning strong scented leaves also require daily uprooting and was therefore found to be very cumbersome.

Mosquito coils were described as moderately effective by users because they are unable to drive away or to kill mosquitoes. A participant described the use of coils as "they only help you doze off, but as soon as the coil dies out, the mosquitoes re-gain renewed strength and bite you". Untreated nets were however found to be effective at preventing mosquito bites compared to the use of coils. The use of nets were not seen as a measure of preventing malaria but against mosquito bites.

The effectiveness of untreated nets compared to the use of mosquito coils and spray show that, if ITNs are promoted, people may prefer them to these products. However, the only way by which treated nets may be preferred to untreated nets will be the effectiveness of the insecticide to kill mosquitoes. This may be the yardstick for measuring the physical effectiveness of insecticide treated bed nets.

Results from the survey indicate that occasional and monthly expenditures for mosquito coils and mosquito spray in the month prior to the interviews, varied in the range of 100 cedis (US$0.20US) to 6000 cedis (US$2.5) and 2880.00 cedis (US$1.20) to 19,200.00 cedis (US$8.00) per month respectively. The mean amount spent on coils was 2280.00 cedis (US$0.95) and 6000.00 cedis (US$2.5) for spray by households. For households who currently use nets the mean average cost per net was 9000.00 cedis (US$3.8. Maximum market price per untreated net was however 20,000.00 cedis (US$8.5).

The main reasons cited for non-use of untreated mosquito nets were unavailability and lack of ready cash to buy where they existed while others described nets as being very expensive. The following table shows potential reasons for non-use of nets.

Table 9: Reasons for the low use of bed nets

[illegible]	[illegible]
Costly	38.8
No money	31.4
Unavailability	21.7
Luxury	0.23
Inconvenience	0.23
Other	7.6
Total	100

The reasons for the low use of nets stem mainly from the fact that they are unaffordable to the majority of the population. A participant put this problem as " It isn't that we do not know the benefits of insecticide treated nets, but it is poverty. That is why we are using strong scented leaves". Thus even though ITNs may be seen as desirable by households as it is shown in the next section, they may remain beyond the means of many households.

5.5 Willingness to pay for insecticide treated bed nets

5.5.1 General findings on willingness to pay for ITNs

About 92% of the respondents were willing to pay for insecticide treated nets. Many have argued that hypothetical questions enquiring about willingness to pay for insecticide treated nets are often not substantive and do not actually predict demand for ITNs (Chavasse et al., 1999). Nonetheless it gives a picture of the potential market for nets as peoples' willingness to pay are backed by other factors as listed below.

Maximum willingness to pay varied with the number of nets required. Willingness to pay was between 9,600.00-20,000.00 cedis (US$4.00-US$8.30) per net for households requiring only one or two ITNs. In households requiring more than two ITNs, maximum willingness to pay was lower (US$3.00-US$6.00). This finding is consistent as result of the fact that the more nets that are required the higher the initial capital outlay that may be needed to pay for ITNs. This also indicates that large families may have lower willingness to pay per net but it does not imply that they do not value insecticide treated nets. The fact is that family sizes are built into the valuation of ITNs. For respondents who currently own untreated nets, maximum willingness to pay was the same as previously bought nets or a few cents higher.

* Exchange rate: 2400.00 cedis: US$ 1.00

Figure 4:

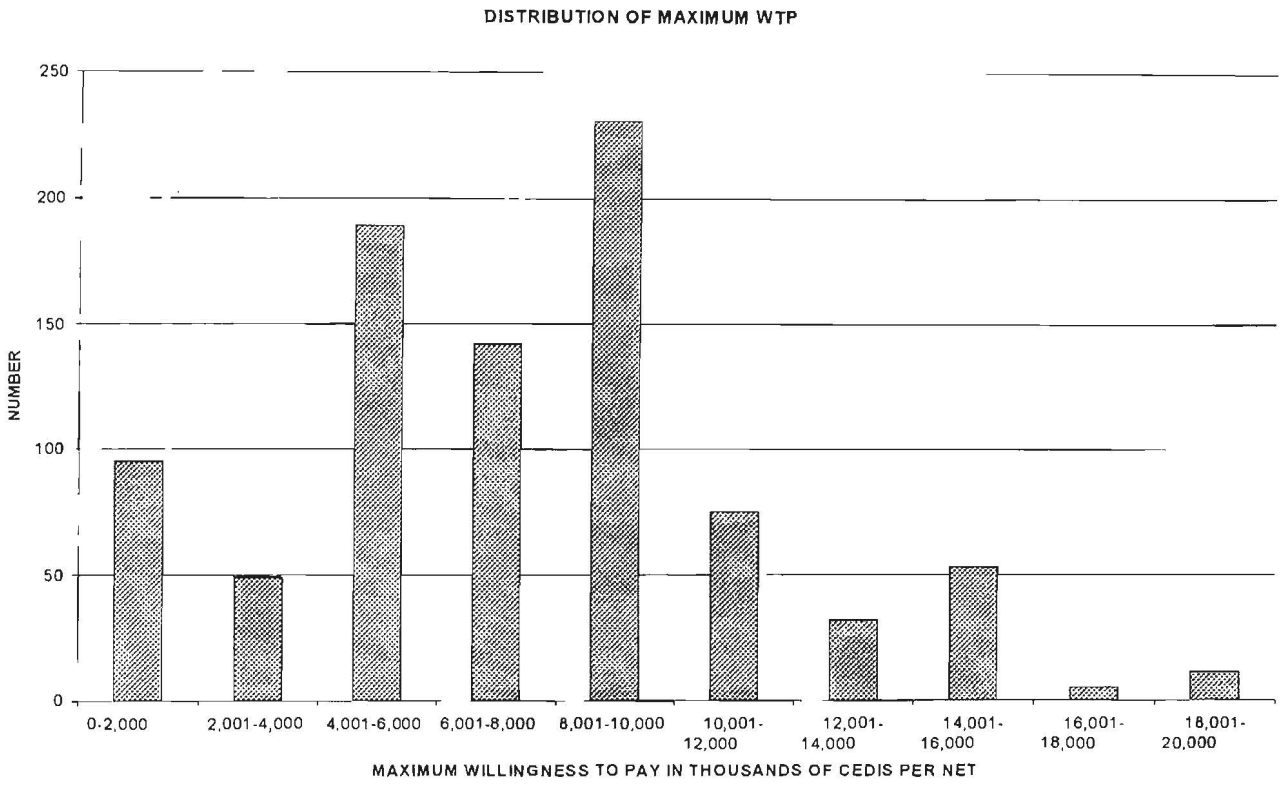


Figure 3 above shows the distribution of maximum willingness to pay for insecticide treated nets in cedis (Ghanaian currency). The mean maximum willingness to pay was in the range 8001-10000 cedis (US$3.3-4.2). Interestingly, there were no major differences in the characteristics of respondents willing to pay above the mean 9120 cedis (US$3.8) except for the fact that respondents willing to pay amounts above the mean average had more education as compared to their counterparts whose WTP was below the mean. About 38.3% have been to school as against 27.3% of those paying less than the mean WTP.

* Exchange rate: 2400.00 cedis: US$ 1.00

The results also show that those respondents paying below the mean WTP were willing to pay in cash. Maximum WTP was also lower for farmers than other group of workers. Married couples had higher maximum willingness to pay than widows. Male respondents also offered much higher values for nets compared to female respondents.

There was also no significant difference in the mean maximum willingness to pay for ITNs between the poorest quintile and the second, third and fourth quintiles. In fact, the median willingness to pay 8000.00 cedis (i.e. US$3.3) was the same for these quintile earners. However, there was a minimal difference in the maximum willingness to pay between the top and bottom quintile. The top quintile income earners were willing to pay 0.17 times more than the bottom quintile and this was expected since they have more income to spend than the poorest quintile. The insignificant difference of the WTP between the bottom and top quintiles may also be due to the fact that the rich do use other measures such as mosquito spray and coil and are therefore not very keen to use ITNs.

Another factor that influenced the differences in maximum willingness to pay between households was the form of payment mechanism the household chose to pay for ITNs. About 26% and 20% of households were willing to pay on credit and during harvest respectively.

For households offering to pay on credit or during harvest, maximum willingness to pay was above the mean average maximum WTP. In fact, mean WTP was 7,157.00 cedis (US$3.00) for respondents willing to pay cash compared to 9,528.00 cedis (US$4.00) for respondents WTP on an instalment basis.

There are other factors that also played a role in the maximum amounts households were willing to pay per ITN and these are explained by the regression results in the next section.

5.5.2 Regression results for WTP for insecticide treated nets

Equation (3) was estimated using the binary logit technique. A positive value for a particular coefficient in this regression implies that as the corresponding independent variable increases, the probability that households will choose to use ITNs increases relative to other consumption goods. Equation (4) and (5) were however estimated using OLS and data for 875 observations for all equations. The results are presented in tables 10, 11, 12 and 13, and at analysed at 5% significance level. The overall fit of the models are good and have signs as expected except the income variable for equation (5). A regression looking at maximum willingness to pay by quintile was also estimated to complement the results from equation (4).

Table 10: Logistic results for household willingness to pay for ITNs

Variable	Estimate	SE	P-value	Probability of buying net
Intercept	-3.3775	1.2684	0.008	-
Household head total income	1.38e-07	4.33e-07	0.750	0.80
Number of nets required by household	1.4076	0.4592	0.002	0.80
Maximum willingness to pay	0.0083	0.0002	0.000	0.50
Children older than 4 years	0.8848	0.4813	0.066	0.71
Knowledge of mosquito as cause of malaria	0.7885	0.8697	0.365	0.69
Education	0.4681	1.0557	0.657	0.62
Household with malaria	1.9545	0.9851	0.047	0.88
Ownership of untreated nets	4.2564	1.7478	0.015	0.99
Household size	-0.7231	0.4627	0.118	0.33
Household with children 0-4 years	0.6389	0.7100	0.375	0.66
Cost of buying untreated nets	-0.0004	0.0002	0.009	0.50
Cost of buying insecticide spray	-0.0005	0.0003	0.036	0.50
Reasons for not using nets	2.2499	0.7632	0.003	0.90
Number of untreated nets household has	-3.9433	0.9615	0.000	0.02
Cost of buying mosquito coil	0.0004	0.0007	0.522	0.50
Pseudo R^2 =0.87				
P>0.0000				

Table 11: OLS Regression results for number of nets households are willing to buy

Variable	Estimate	SE	P-value
Intercept	0.3640	0.1476	0.014
Household head total income	-5.73e-09	3.26e-08	0.861
Area of residence	-0.2512	0.0928	0.007
Gender	-0.374	0.0871	0.000
Form of payment for ITN	0.7680	0.0815	0.000
Education	0.0542	0.9923	0.585
Gifts received in kind/cash	3.17e-06	1.04e-06	0.002
Household size	0.1810	0.0177	0.000
Households with children 0- 4 years	0.0334	0.0579	0.564
Cost of buying untreated nets	-9.18e-06	0.00001	0.428
Cost of buying insecticide spray	-0.00003	0.00003	0.287
Reasons for not using nets	0.1117	0.0865	0.197
Cost of buying mosquito coil	-0.00003	0.00005	0.509
Cost of other mosquito preventive measures	0.00006	0.00005	0.159
Number of household members ill	0.00003	0.0532	0.244
Cost of treating malaria	8.22e-06	3.38-e06	0.015
Radio	0.3307	0.0580	0.000
Maximum willingness to pay	0.00003	0.00001	0.007
R^2=0.36			
P>0.0000			

Table 12: OLS Regression results for maximum amounts households are willing to pay per ITN

variable	Estimate	SE	P-value
Intercept	227.6827	462.6567	0.623
Household head total income	0.0001	0.0001	0.312
Number of nets required by household	-290.2759	102.397	0.005
Form of payment for ITN	1559.609	238.5254	0.000
Education	292.7026	272.142	0.282
Ownership of untreated nets	-1704.812	681.8164	0.013
Household size	-158.5521	53.4683	0.003
Households with children 0- 4 years	304.5793	164.485	0.064
Willingness to pay	8971.533	483.7896	0.000
Cost of buying untreated nets	0.1154	0.0447	0.010
Cost of buying insecticide spray	0.1003	0.0797	0.208
Reasons for not using nets	-599.4928	265.2135	0.024
Number of untreated nets household has	1170.164	481.4774	0.015
Cost of buying mosquito coil	0.0831	0.1345	0.537
Number of household members ill	207.5292	136.2104	0.128
Ownership of radio	578.8284	168.9063	0.001
R^2=0.40			
Prob >F= 0.0000			

Table 13: Maximum willingness to pay by Quintile (N=175 per Quintile)

Variable1	Quintile1	Quintile2	Quintile3	Quintile4	Quintile5
Intercept					
Estimate	6370.03	19852.52	8958.274	7506.084	8350.073
SE	1241.215	1864.553	1442.815	1369.295	1700.395
P=	0.000	0.000	0.000	0.000	0.000
Household head total income					
Estimate	0.0007	-0.00002	0.0082	0.0001	0.0001
SE	0.0005	0.0004	0.0004	0.0002	0.0002
P=	0.157	0.951	0.041	0.523	0.690
Number nets required by household					
Estimate	616.093	569.9746	112.3051	-99.2077	413.6377
SE	294.173	280.457	235.4803	215.1144	299.4867
P=	0.038	0.044	0.634	0.645	0.170
Education					
Estimate	614.9564	-533.6782	314.2216	1072.266	57.1285
SE	887.5252	641.2638	666.9174	635.84	842.511
P=	0.489	0.407	0.638	0.094	0.946
Ownership of untreated nets					
Estimate	9175.712	-2075.192	-3372.072	-948.2459	-984.5253
SE	3820.306	1578.006	2948.078	1706.444	1813.227
P=	0.017	0.190	0.067	0.579	0.588
Household size					
Estimate	-59.8903	-91.8169	-207.5424	-88.1271	-337.6386
SE	142.7892	131.2105	129.7644	148.3204	161.7436
P=	0.675	0.485	0.112	0.553	0.021
Household with children 0-4 years					
Estimate	497.4904	-1.3236	-258.5084	534.6166	149.9764
SE	488.223	398.383	397.5444	432.3733	461.6435
P=	0.310	0.997	0.516	0.218	0.746
Cost of buying untreated nets					
Estimate	-0.0550	0.1592	0.1978	-0.2286	0.1914
SE	0.1357	0.1152	0. 1356	0.1095	0.1096
P=	0.686	0.169	0.147	0.039	0.083
Cost of buying insecticide spray					
Estimate	0.0480	1.4348	0.0368	-0.2395	-0.0506
SE	0.4959	0.3801	0.2736	0.2529	0.1397
P=	0.923	0.000	0.893	0.357	0.718
Reasons for not using nets					
Estimate	1194.681	-1554.351	1528.515	-597.6834	1272.901
SE	592.0757	582.7131	717.5114	658.9141	862.0688
P=	0.046	0.008	0.035	0.366	0.142
Number of nets household already has					
Estimate	8789.493	1753.383	1421.626	1629.094	-404.2648
SE	3452.106	1670.249	1239.614	1176 956	1076.466
P=	0.012	0.295	0.253	0 168	0.708
Household members ill					
Estimate	365.3115	991.3795	294.5197	-244.0347	288.2227
SE	370.8919	381.3859	352.1149	384.2228	496.7844
P=	0.326	0.010	0.404	0.526	0.383
Form of payment					
Estimate	1611.112	1953.115	1321.651	1983.062	2512.086
SE	589.3896	540.4217	626.0031	572.1248	797.3786
P=	0.007	0.000	0.036	0.001	0.002
Radio					
Estimate	698.443	-314.6582	812.1903	958.7167	488.2227
SE	465.3984	536.852	410.05	409.7614	496.7844
P=	0.135	0.559	0.049	0.021	0.328
Cost of buying mosquito coil					
Estimate	0.3930	0.6967	0.7835	-0.1305	0.2082
SE	0.5097	0.3502	0.4337	0.3174	0.3277
P=	0.445	0.048	0.857	0.682	0.526
Willingness to pay					
Estimate	2040.392	10025.65	-2019.942	-537.0768	-1313 9
SE	630.6964	1347.253	538.547	284.5699	381.1925
P=	0.001	0.000	0.000	0.061	0.001
Cost of other mosquito preventive measures					
Estimate	0.3730	0.0147	-0.6073	-0.2945	-0.5306
SE	0.3696	0.2896	0.7105	0.2460	0.3612
P=	0.314	0.959	0.394	0.233	0.144

Results from table 10 indicate that the number of nets a household needs have an effect on their willingness to pay for ITNs. The probability of the willingness to buy was about 0.80 or about 80% for households needing nets. On average households were willing to buy two ITNs. The smallest household size was 5 and 17 for the largest household. One may explain that the smaller the number of nets that a household needs, the more willing they may be to own and use nets, because fewer nets are associated with smaller total cost. Alternatively, the larger the household size, the less likely they may be to choose ITNs as they have a greater cost to bear. This is illustrated in table 12, where the amount households were willing to pay decreased with the household size. Larger households quoted very low prices to buy nets. This does not however imply that large households do not value the use of ITNs but the fact is that family sizes are taken into account in valuation of the households ability to pay.

The coefficient for respondents whose household members were currently ill with malaria was statistically significant (table 10). The probability that households with malaria will buy ITNs is as high as 0.88 or about 88%, highlighting the fact that in areas were malaria exerts greater impact on the health of the people or where the incidence of malaria is high, people are more likely to choose the use of ITNs. It can also be seen in the light of the fact that people suffering from malaria immediately see the benefits of using ITNs more than people who are not suffering from malaria. It also implies that as the burden of malaria reduces in the future or in areas where malaria is not a serious problem, demand for ITNs will be low. These all have their

consequences in that ITNs may only be demanded when people have malaria than when there is less malaria as confirmed in the previous sections.

There appears to also be a positive correlation between willingness to pay and amounts households expressed to pay for ITNs. Maximum amounts households wanted to pay varied significantly with WTP, implying that where people are less willing to use nets, prices quoted for ITNs will be significantly low. This is consistent with economic theory in that people tend to place low values on goods that are not a priority to them. Results from the focus group sessions also pointed to the fact that the use of ITNs is not a priority to households. Households prefer to buy household items such as a zinc roof, bicycles and cooking utensils in the case of women, which they see to derive more benefits from than insecticide treated nets. This trend in household priority may result from the fact that the importance of the use of nets is not well understood and this may be complicated by the fact that few people in this survey knew the link between severe malaria and the mosquito.

There was a significant relationship between the amounts of money households were WTP and the form of payment (credit, during or after harvest) households chose to purchase ITNs (tables 11, 12). Only 18% of households wanted to pay cash for their first net and about 26% and 20% of households wanted to pay for the rest of their ITNs on credit and during or after harvest respectively. Willingness to pay among households that wanted to purchase nets in cash was lower than for households that wanted to spread payments for the rest of theirs nets over a period of time, as discussed earlier on. The magnitude of this variable implies that although ITNs are desirable their initial capital outlay may place a major constraint on their demand.

Results generated by quintiles (table 13) showed the same pattern for all quintiles, indicating that irrespective of the level of income, purchasing nets in cash is a key constraint.

The main reasons for the low usage of nets (lack of money, nets are expensive) go to substantiate the fact that ITNs may not be purchased with ready cash. The probability that people citing factors such as lack of ready cash and nets are expensive would not buy ITNs is considerably high (0.90). As people continue to complain of lack of money to buy ITNs and the high cost involve in buying them, demand for ITNs may remain low if income-generating activities and jobs are not created to increase the availability of cash to rural areas and the population as a whole. About 85% of the population in northern Ghana live in rural areas and rely solely on agriculture. The unfavourable weather conditions make output and incomes very unstable.

Apart from the factors discussed above, households that use mosquito coils, spray and untreated nets also had a low tendency to acquire nets (table 10, 12). Although current ownership of untreated nets would not influence the likelihood of households to buy nets (prob.0.02), the price of untreated nets tended to have a negative impact on the demand for ITNs. The negative findings suggest that, a decrease in the price of untreated nets would reduce the likelihood of households choosing to use ITNs by 50%. Likewise, the increase in the price of untreated nets will increase the probability of households to use ITNs.

The use of mosquito coil, spray, and untreated nets are clearly substitutes to ITNs although use of mosquito coil and spray were not statistically significant (table12).

In the logit regression, the probability that households using spray and untreated nets would not use ITNs was about 0.50. A clear distinction of the potential benefits of ITNs as compared to the use of untreated nets needs to be promoted vigorously if people are to be persuaded to use ITNs instead of untreated nets. Emphasis on re-treatment practices and the effectiveness of the insecticide must be a critical issue in the promotion of ITNs.

Although households that perceive malaria to be caused by the mosquito had a high probability (0.69) of buying ITNs compared to households without this knowledge, this did not appear to have any significant impact on the amounts they were WTP for ITNs. The insignificance of this finding probably shows the perception of people about malaria. From the literature, mild malaria is often not regarded as a problem and few people also associate severe malaria (cerebral malaria, convulsion) with the mosquito. Thus even though knowledge of the mosquito and malaria exist its possible consequences are still yet to make its impact on people in rural areas of northern Ghana and probably elsewhere.

Results from table 11 also show that female household heads were less likely to purchase nets. Although male household heads were offering higher values for ITNs than female household heads, the difference was minimal. The main difference was that male household heads were willing to buy more nets than female household heads, with equal household size. This difference may be due to the fact that fewer household heads are female and the majority of these women are widows with little income to support a family as a single parent.

Another factor influencing WTP to pay was area of residence. More households in the rural area were willing to buy more nets or required more nets compared to households in the urban area (table 11). A possible explanation for this difference may be that urban households have more access to health facilities for prompt treatment of diseases and they also use other mosquito and malaria control products than rural households. About 34% and 17% of households in urban areas use mosquito coil and spray as against 11% and 1.2% from the rural areas respectively. There was no significant difference in household size between the rural and urban areas.

Education did have an influence on the likelihood (prob. 62) of households to use ITNs but had no effect on the amounts they were willing to pay. One may argue that the insignificance of the education coefficient to influence amounts households were WTP per net stems from the fact that majority of respondents are illiterate and are mostly farmers.

Insecticide treated nets have been found to provide more protection to children under five years of age than any other age group and it is advocated that bed nets promotion should focus on promoting the protection of the child. In the light of this a variable of children under five years of age was included in the regressions and findings are discussed in the next section.

5.5.3 Is the child a priority in the use of insecticide treated nets

The regression results on willingness to pay for insecticide treated bed nets was positively related to households with children age 0-4 years (tables 10, 11, 12, 13). The likelihood or probability that households with children 0-4 years would want to use nets (prob. 0.66) was however lower than households with older children (prob.0.71). The use of ITNs to protect children from malaria was a view that was shared by focus group participants in this study but it was not a priority. Participants agreed that nets should be given to children because they are more vulnerable and are also unable to express themselves when they are sick, but they would prefer to acquire nets for the whole family. This may explain the insignificance of the coefficient of children less than four (table 12). Malaria is believed not to only have a social impact on the family but could also produce economic consequences especially for the breadwinner of the family. It is believed that when any member of the family is ill, the whole family is ill as well because they are psychologically affected.

Participants pointed out that, during the rainy and farming season if the child is protected and the productive age family members are left to fight the mosquitoes all night and consequently become sick, there would be less hands on the farm. Less productivity implies less food and when there is no food, the child cannot be protected from other diseases. The following excerpts point to this fact:

If I can buy one (bed net) I would use it for all of us, because if I am sick and can't go out to work, the children would still be sick because hunger is sickness and if I go out and come to see that the children have not used the net and mosquitoes have bitten

them, is also sickness and if my wife is sick, she can't cook for the house.....(male participant- Dapooretindongo).

If you buy for your wife and children, and you (household head) get malaria, the whole family is also sick. If you use the net for yourself, other members of the family would be sick and you would be sick also. In this case, it is better to buy for everyone one, your wife, children and yourself (male participant- Shia Tongo).

The discussions indicate that the whole family requires nets. The priority therefore in the promotion of insecticide nets should focus on making nets available to the whole family. Even though households require ITNs for use by the whole family but will they be able to afford all the nets they require. The next sections shed light on the ability of households to pay for the nets they may require.

5.6 Ability to pay for insecticide treated nets

The affordability of health care or services by households remains a very critical policy issue. In an attempt to assess the affordability of insecticide treated bed nets by households, a number of measures were considered and are discussed below.

5.6.1 Household consumption expenditure/ income and ability to pay for ITNs

Total income and expenditure for the year was arrived at by multiplying monthly incomes and expenditure by twelve. Mean and median income and expenditure are shown in tables 14 and 15.

Incomes were grossly below expenditures for the year. This may be due to the fact that incomes collected were only that of the household head. The contributions from spouses were not considered and this may explain the difference.

Table 14: Percentage of yearly income and expenditure per ITN

Variable	Mean		Median		Sd	%
Income	898,715.6	(US$ 374.5)*	494,000.00	(US$205.8)	1320227	1.0
Expenditure	1410266.66	(587.6)	1,232,796.00	(US$ 513.7)	1006482	0.7

Exchange rate: 2400.00 cedis: US$ 1.00

Table 15: Percentage of yearly income and expenditure by area

Variable	Urban	Rural
Income	498,000.00 (207.5)*	421,200.00 (US$175.5)
Percentage per net (%)	1.8	2.2
Expenditure	1679730 (US$699.9)	1271341 (US$529.7)
Percentage per net (%)	0.5	0.7

* Exchange rate: 2400.00 cedis: US$ 1.00

The mean WTP per net was 1% of household total income and 0.7% of total household expenditure.

Households in the rural areas are currently paying 2.2% of their mean annual income and 0.7% of the annual mean expenditure per net as compared to 1.8% and 0.5% by urban households (table 15). This clearly indicates that the lower income groups are paying more from their annual income and expenditure than higher income earners.

The WTP of the poorest quintile was also 1.7% and 1.2% of income (US$184.5) and expenditure (US$259) respectively per net as against the richest quintile of 0.5% and 0.3% of income (US$750.5) and expenditure (US$1255.8).

Tables 16-19 below give results on the percentage of household income and expenditure spent on occasional items such as school fees, clothing, funerals, tobacco and drink. One must however bear in mind that these data were collected a month after the Christmas festivities and also coincided with the time for performing funerals (memorial services) in the district and the figures may be higher than under normal circumstances.

Table 16: Household basic and occasional expenditure

Item	Expenditure*	Expenditure**
Food	941995.9 (US$392.5)	78499.9 (US$32.7)
Utilities	271015.1 (US$112.9)	-
Health care	102231.00 (42.6)	16330.00 (US$6.8)
School fees	7339.1 (US$3.1)	19134.0 (US$8.0)
Clothing and wares	47926.5 (US$ 20.0)	53160.0 (US$22.0)
Family celebration (funerals)	4480.4 (US$ 1.9)	29072.4 (US$12.0)
Drink and tobacco	26640 (US$11.1)	40748.3 (US$17.0)*
Total	1470012.36 (US$612.6)	158444.7 (US$66)

* Exchange rate: 2400.00 cedis: US$ 1.00

**Average number of households that made expenses on items above during the survey

***Expenditure for all household

Table 17: Percentage of household income/expenditure on basic and occasional items

Expenditure	% of income	% of expenditure
Food	(4.8)*	67
Utilities	51	19.2
Health care	11.4	7.3
School fees	0.8	0.5
Clothing	3.9	2.5
Family celebration (funerals)	0.5	0.4
Drink and tobacco	3	4.1
Total	(75.4)**	100

*Households spend 4.8% more than their stated total incomes on food

**75.4% expenditure in excess of incomes stated by respondents.

Table 18: Household occasional expenditure as percentage of annual expenditure by area

Expenditure	Urban (%)	Rural (%)
School fees	0.8	0.3
Clothing	4	3
Family celebration (funerals)	1.5	2.4
Drink and tobacco	1.3	2.3
Total	7.6	5.3

Table 19: Household occasional expenditure by income quintile as percentage of annual expenditure

Expenditure	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
School fees	0.2	0.4	0.5	0.5	0.7
Clothing/shoes	1.5	2.1	2.4	2.4	2.9
Drink and tobacco	2.2	1.8	2.5	1.8	1.5
Total	3.9	4.3	5.4	4.7	5.1

Generally households spend almost 7.5% of their annual expenditure on occasional expenditures like school fees, clothing, funerals, drinks and tobacco. They spend about 67% and 19.7% on food and utilities (water, electricity, kerosene, firewood and charcoal).

A look at occasional expenditure by households' by area show a similar pattern where rural households spend about 5.3% of their annual expenditure on these items compared to 7.6% by urban households (table 18). Interestingly, rural households and the poorest quintile spend approximately 0.3%, 0.2% of annual expenditure on school fees but 2.4% and 2.3% on drinks and tobacco. The top quintile and other income groups rather spend more on the education of their children than on drinks compared to the former. One may explain this pattern of the rich spending more on education than on drinks by the fact that the rich are more literate and therefore see the benefits of investing in education than the poor who cannot afford to pay school fees for their children to reach higher levels of education. One could also explain this pattern by arguing that the rich tend to send their children to private schools where fees are high due to the quality of education than the poor. As I indicated earlier, these results need to be interpreted cautiously as the data was collected a month after the Christmas festivities where the poor could have decided to spend more on this occasion on items they usually do not patronise but the expenditure pattern on drinks for the rich may have remained the same.

As shown previously, the bottom quintile mean WTP of 7,440.00 cedis (US$3.1) was below the average mean WTP of 9,120.00 cedis (US$3.8). However if households require on average three ITNs, it implies the bottom quintile will be paying 4.5% of its total annual expenditure at the mean maximum willingness to pay whilst the top quintile will be paying just 1.0% of its annual total expenditure for the same number of nets.

The World Bank estimates that in developing countries people spend about 2-5% of their yearly income on health care and argue that user fees that would allow poor households to spend 1% of annual income assuming two visits per person in the year is modest. One must however, take into account the fact that insecticide treated nets are just one health service for a particular disease and households may be paying for other health care in addition. Therefore, it would be particularly onerous for low income households to buy ITNs in addition to meeting the cost of routine health service requirements. Insecticide treated nets are currently sold at a subsidised (factory) price of 12,000.00 cedis (US$5.00) and 1,200.00 cedis (US$0.5) for insecticide in Ghana, which is higher than the mean maximum WTP in this study. The current subsidised price per ITN is 0.31 times higher than respondents expressed to pay in this survey.

Considering the fact that basic necessities such as food, clothing and education are all very important in the production of health, one would not expect households to cut down on these already low expenditures. However, looking at current expenditure on drinks and tobacco, which average 2% of expenditure for all households and income quintiles, one may be attempted to conclude that households can sacrifice these discretionary expenditure to buy ITNs; but if one takes into account the current maximum willingness to pay of 9,120 (US$3.8), the poorest quintile will need about 3.5% more (in addition to 2% from drink and tobacco) of its annual expenditure to purchase an average of three nets adequate for the family. If prices are set at the factory price (US$5.5), and poorer households do away with drinks and tobacco, they will still need 4.6% of their annual expenditure to be able to buy ITNs.

We must also bear in mind that tobacco and alcohol consumption are more of habit and addiction which are often very difficult to give up. Thus pricing nets equally for the urban and rural, rich and poor will be very regressive and may not represent ability to pay for all households. Other health care expenditure could put even more toll on poorer households as highlighted in the next section.

5.6.2 Health care expenditure by households

Past health care expenditure has often been used to assess the affordability of a particular health care or service (Weaver et al.; 1996). Past health expenditures have nonetheless, been argued not to be an appropriate measure of ability to pay as families could go into debt to treat a family member and is also fraught with the difficulty of calculating household yearly income (Russell 1996).

Despite the potential weakness of measuring health care expenditure as percentage of household income, this study collected data on past health care expenditure to see its relationship to potential demand for insecticide treated bed nets.

Households in the urban areas generally spent about 5.7% of their annual expenditure on health care which is almost on a par with World Bank estimates for health care expenditures in developing countries while rural households spent about 7% of annual expenditure on health care.

The difference in health care expenditure between urban and rural dwellers may result from the fact that, urban households, who are better educated, are better producers of health than rural households since they are able to use health information available to them better (Wagstaff 1989). One may also explain that they spend and use other mosquito products which very few rural dwellers do.

Also for households that sought health care in the month prior to the survey, the mean and median health expenditure for the month were 16,330.00 cedis (US$6.8) and 8,000.00 cedis (US$3.3) respectively. Median and mean health expenditure by households whose members had malaria was 8,000 cedis (US$3.30) and 14,432.00 cedis (US$6.0).

If we assume malaria treatment takes about half the health care expenditure by households from these results and if this amount is spent on ITNs, ITNs may still remain beyond the reach of the poor who would need about 4.5% of annual expenditure to purchase the nets they require at the mean maximum willingness to pay but will need about 6.6% of annual expenditure to buy nets at the current factory price of nets.

Furthermore, median health care expenditure for the month prior to the survey was almost equivalent to the mean maximum willingness to pay for insecticide treated nets but households do go into borrowing money to pay for expenses they incur. About 46.8% of the households whose members were ill in the month prior to the survey

repaid money they owed (mean=US$11.64) and about 32% of these households had a member of the family ill with malaria.

Information was not collected on what the money was borrowed for and therefore, it is inconclusive to say if it was spent on treating malaria or to pay for other expenses. However, as it has been pointed out in other studies, households may sacrifice other basic necessities such as food and education to pay hospital bills, which could have short-term and possible long-term consequences for the family. Payment for health services is sometimes made at a considerable social cost to the family and can scarcely be said to represent a "willingness" to pay (Russell, 1996).

The modes of payment available for ITNs in this survey comprised various sources. Some participants mentioned that they would sell their animals to purchase ITNs and the majority were willing to pay after harvest, which meant that farm produce would be sold to purchase ITNs. As to whether these animals and food are excess that could be sold without potential consequences for the family, it was difficult to tell as no question was included to measure that. Consequently, one cannot talk about ability to pay among the poor and poorest in rural Africa for all the ITNs they may require.

5.6.3 Asset possession and impact on demand for insecticide treated nets

The possession of certain household assets has been said to be a potential measure of ability of households to pay for services. This study therefore looked at various household assets and their potential impact on demand for ITNs. The possession of a

radio and a sewing machine were the only assets that were found to significantly influence willingness and ability to pay for insecticide treated nets (appendix IV).

This suggest that owners of radios may have access to information on preventive measures and health education in general, which they may utilise to improve their health status. It is also a potential indicator of ability to pay as reported by other studies (Chavasse et al., 1999). Approximately 34% of respondents in the rural area and 66% in the urban area owned radios.

A sewing machine is an income generating asset and thus will provide money for the purchase of insecticide treated nets. For households who currently own untreated nets possession of the following assets: radio, television sets and bicycles were all influential and statistically significant (appendix III B). Assets such as bicycle, vehicle, bed, coal pot, television sets, gas or electric cookers (appendix III A) did not have any impact on willingness and ability to pay in this study.
It therefore follows that the decision to buy a net is not significantly influenced by the possession of these assets in large rural populations where the percentage of people who own them is small.

5.6.4 Payment mechanisms for treated bed net

ITNs are a one off expenditure but their initial capital outlay may be a constraint to households willing to pay for them. Different payment option questions were included in this survey to assess the demand for insecticide treated bed nets.

Maximum willingness to pay was high and there was statistically significant difference between respondents who were willing to pay on an instalment basis or at the time of harvest and those respondents who were willing to pay cash. Only 11% of respondents were willing to pay cash for one net, 8.45% for two nets and only 1.03% for three nets.

These findings were consistent with the responses from the focus group discussions. During the focus group discussions respondents mentioned paying about a dollar per month on an instalment basis for a net while some traders mentioned that they could afford to pay 500.00 cedis (US$0.20) every market day, which is every three days in this district. Male participants in the focus group discussions, who were mainly farmers, said they will only be able to pay after the harvest season. The latter mode of payment has been found not to be feasible in other studies because when cash is available after harvest, there are few mosquitoes and people do not see the need to buy ITNs (Zimicki *et al* 1994).

Modes of payment for insecticide treated bed nets included initial deposits, and monthly or weekly payments. Others included after harvest where some food could be sold but this may not be a stable source of income since harvest keep fluctuating and it is only excess food that would be sold.

Prepayments for nets were not seen to be feasible as respondents wanted to own nets before continuing any financial commitment. Suggestions made by some participants were that, nets should be made available during the peak biting period. It is believed that people will be more willing to purchase ITNs at this time than other times.

5.7 Household priority and insecticide treated bed nets

Decision making in some large rural sub-Sahara Africa countries is solely vested in male spouses. This may be due to the fact that males in these communities may have more access to cash income and other potential resources and because of cultural factors men are the heads of families. However, the decision to buy certain possessions or to seek health care may be shared by both spouses. The decision to buy land, animals, build houses, furniture are solely the responsibility of the man as they involve large capital outlays. Women take responsibility in making decisions on household wares such as cooking utensils but rely for financial assistance from the male spouse. A woman could also execute this duty without informing the male spouse if they had enough cash income of their own.

The decision to seek health care for a child was found to be a shared responsibility. In the focus group discussions, the health of a child is a very critical issue and the decision to seek care is the responsibility of both spouses. It was however agreed that women would usually need to inform the husband before seeking health care as the man is not always in close contact with children. Respondents mentioned that if the male spouse has no money to seek health care for the child, women go out to borrow money or use any money they have to take the child to the hospital or to seek traditional treatment.

Decisions on the purchase of insecticide treated bed nets was also seen as a shared responsibility and either spouse could buy it.

For the rural communities, women rely sometimes solely on financial resources from their husbands as they do not have other means of earning money. Thus the decision to buy a net though might be an idea of the woman, the male spouse would have to provide money for the net to be bought.

In a ranking exercise, participants in the focus group discussions were asked to rank the insecticide treated net vis-à-vis other household items in terms of its priority in the households if they had available cash to buy these items. Items like buckets, basins and bowls were ranked higher to the net among women participants who did not have these items at home.

In the male groups, items like zinc and bicycle were preferred to the net as zinc provides a better roofing material and lasts longer. The bicycle was said to provide transport to rural folks that were far away from the nearest health facility. The bicycle also provided transport to far away farmlands.

Items like buckets, basins and bowls were seen as mainly the responsibility of women and men would prefer to buy insecticide treated bed nets to buying the items listed by women.

The women on the other hand would prefer to buy the net compared to buying items such as zinc and bicycle. Insecticide treated nets were preferred to a tape recorder, motorcycle in this large rural population.

A number of participants preferred the net to all these other items mentioned above. The main reason was that, in times of severe illness one would sell all these items to seek medical care and if the mosquito net would prevent one from getting severely ill, it was preferable to the possession of the items listed above.

Clearly, households would seek to buy treated bed nets if they already have items such as bicycle, zinc roofing materials, buckets, and cooking utensils. The non-possession of items like tape recorder, motorcycle may not hinder demand for insecticide treated bed net in a potential large rural community.

Thus, while the decision to buy an insecticide treated bed net is a shared responsibility in the family, the spouse with potential cash has the final say.

Chapter 6

DISCUSSION

The purpose of this study was to establish factors that determine household's willingness and ability to pay for insecticide treated nets, by considering economic, demographic and health factors of the population under study.

There is still a weak perceived link between mosquito and severe malaria presenting in the form of convulsion. Other factors (wind and cold, eating sweet foods) which are perceived to cause malaria may therefore play a major role in the health-seeking behaviour of these communities and prompt treatment would not be sought to prevent the disease progressing into the severe form.

The results also clearly indicate that very few people recognise malaria as prevalent all year round. People link the density of mosquitoes to malaria and seem to ignore malaria as a problem in the dry season when there are very few mosquitoes. This perception of the season of malaria will have an effect on the use of insecticide treated nets as they are likely to be used only during the peak biting period and would not be seen as necessary when mosquitoes are few. A study in Nepal found that the overall net usage dropped from 75.2 to 79.7 to 46.6 to 67.8% during the hot dry season (Cattani et al). Another issue to consider is that, there is going to be a problem of getting nets re-treated when it is necessary because if people do not use nets in the dry season, they would not see the need to re-treat them.

In areas that have low mosquito densities because of their geographical location, the use of insecticide nets will be low even during the rainy season (Hii et al., 1987).

A clear clarification of the fact that the bite of a single mosquito as with the bite of several mosquitoes could lead to malaria may erase the erroneous idea that malaria is only present during the peak biting period. Health education on the link between the mosquito and severe malaria and its fatal consequences is necessary if nets are to be used regularly. Intensive health education using visual aids to show malaria in its severe form and its potential consequences especially among mothers and fathers, may improve the understanding of malaria as a problem requiring serious and early attention. Other benefits of the use of insecticide treated nets such as providing good sleep, reducing the time and cost involved in seeking treatment for malaria and the psychological stress may be used in promoting the use of insecticide treated nets.

Private providers continue to play a key role in providing health care to remote rural communities. Drug peddlers for example were equated to professional health staff in the survey. The main problem with drug peddlers providing care to rural populations is that they provide inexpensive drugs and more often than not, the recommended dosage is not prescribed. The consequences of their activities are great since it may lead to drug resistance and repeated attacks of the disease. Integrating their services formally into the health sector stream could improve diagnosis of diseases and the services they provide.

6.1 Are households willing and able to pay for insecticide treated nets

Willingness and ability to pay are often taken to mean one and the same thing. The findings from this study however point to the contrary. There was an expressed willingness to pay by about 92% by all households but the ability to pay of households was determined by a number of factors. The mean maximum willingness to pay was 9,120.00 cedis (US$3.8) which is actually below the current factory price of 12,000.00 cedis (US$5.0) per net and 1,200.00 (US$0.5) for insecticide. Factors that influenced willingness to pay were the size of the household, the mode of payment for insecticide treated nets, the number of treated nets households already possess, the price of untreated nets and the possession of a radio.

Households are particularly concerned about buying ITNs for the whole family and not just for the protection of the child. ITNs have been found to provide better protection against morbidity and mortality from malaria for children under five years of age from the insecticide treated net trials (Alonso *et al* 1993b; D'Alessandro *et al.* 1995; Binka *et al.* 1996, Nevill *et al*; 1996). Protection of young children was also found to be a concern of households but not a priority. Households rather looked at the amount of protection against mosquito bites for the productive age-group family members during the farming season that could possibly increase the time available for farm work and increase productivity.

The initial capital outlay that a family requires to buy ITNs it needs is a key constraint. Only about 18% of respondents were willing to pay cash for one net and to pay for the rest of the nets they required on an instalment basis.

About 26% and 20% were ready to purchase insecticide treated nets on a credit basis and after harvest, respectively. Even among households who are willing to pay for insecticide treated nets on an instalment basis, they were only willing to pay one dollar per month for a net. Thus, if a household requires two nets, it would take eight months to pay the instalments for all nets at the mean maximum willingness to pay but will use a whole year to pay for the same number of nets at the current factory price of nets.

The poor and poorer quintiles may need to devote about 4.5% of their annual expenditure to purchasing insecticide treated nets for the whole family at the mean maximum willingness to pay of 9000. 00 cedis (US$ 3.8), which represents 1.2% of annual expenditure per net. If prices are set at the current factory price, these poorer households will need to spend 2.2% of their annual expenditure per net. If these households even stop spending on items like tobacco and alcohol, they have to find an extra 2.5% or 4.6% (if the current factory price is charged) before they can purchase the ITNs they require. This points to the fact that insecticide treated nets may not be affordable to large rural populations who form a greater proportion of sub-Saharan Africa. Among urban households however, they will require 1.5% of annual expenditure to buy an average of three nets at the mean maximum willingness to pay or 2.4% at the current factory price while residents in urban areas may not necessarily require to pay on a credit basis, they have alternatives such as mosquito coils, spray and untreated nets which they may use if ITNs become unaffordable to them.

The issue of whether households will re-impregnate their nets once purchased is also of concern. For example, the major reason cited for low re-impregnation in the Gambia was the lack of ready cash (Zimicki, et al., 1994). Further more low income was reported as the main reason for low usage of nets among poor households (Aikins et al. 1994). A study was also conducted in the Gambia to find potential financing schemes for the purchase of insecticides for net impregnation (Mills et al; 1994). These findings all point to the critical issue of the availability of ready cash for ITNs. Thus any pricing policy would have to consider the initial cost of buying ITNs to the household and the subsequent cost that has to be incurred at every re-impregnation.

Another problem arising from the use of insecticide treated nets was its priority relative to other goods and services among households. ITNs may not receive high priority among households that do not currently possess assets like a zinc roof, bicycle, and cooking utensils. The decision to buy a net is a shared responsibility among couples and even though nets are seen as desirable, they take a last place among couples if the items mentioned above are needed in the family. Thus devoting 2.2% (at factory price) of household total expenditure per net is particularly questionable, as ITNs are not a priority relative to other household goods. Although the cost of purchasing an insecticide treated net is very small relative to items like a zinc roof, bicycle and cooking utensils, its priority is a factor that needs to be seriously considered in promotional activities.

- Exchange rate: 2400.00 cedis: US$ 1.00

The use and possession of a radio was one factor that highly influenced willingness to for ITNs and this may be a potential source of advertising for the use of ITNs, since the use of radios are more widespread in rural areas than any other form of communication.

6.2 Limitations of Study

1. Potential bias found in contingent valuation studies might exist although all measures were put in place to reduce this bias.

2. The study was not able to collect information on incomes of spouses who might be contributing to the household budget. Information on household income is based solely on the household head.

3. The understatement of incomes by respondents is also a likely possibility in this study.
4. Expenditure patterns may be biased by the timing of the study.

5. The one month recall period for expenditures may also have led to mis-reporting and under reporting of expenditures. Despite these lapses in the methodology, results from the study are consistent and reliable.

Chapter 7

CONCLUSION AND RECOMMENDATIONS

Poor knowledge of the causes of malaria and its link to cerebral malaria is still widespread in rural communities. Health education needs to be designed to inform people and to educate them on the link between the mosquito, malaria and severe malaria and methods available for protection against mosquito bites. ITNs could be promoted as the most effective mosquito control tool and emphasis on the need to re-impregnate nets regularly should form a crucial part of ITN promotional activities. The nets and insecticide have to be promoted as one product and the insecticide has to be seen as the product that makes a great difference between ITNs and untreated nets. Inadequate education may lead to people using nets without necessarily treating them.

The potential consequences of malaria on productivity were greatly emphasised by the demand for nets for the whole family and not just for the protection of the child. This may also be used in the promotion of nets by portraying the correlation between the use of insecticide treated nets and more energy and healthy days for farm work and other businesses.

Rural dwellers have more access to information on the radio than any other means of communication in Ghana and if insecticide treated nets are promoted using radio for rural communities and the population as a whole it may increase potential demand for insecticide treated nets.

There is the recognition that even with widespread use of ITNs, there will still be malaria and the role of private providers who are key providers of health care in rural communities cannot be continuously overlooked. Problems with private providers such as provision of cheap and inadequate recommended doses would have to be addressed to improve their services in these areas were formal health services do not exist or are inaccessible for various reasons.

This group of providers could be integrated formally into the formal health sector and provided with good training on knowledge of diseases, their causes and the effects of drugs not taken properly. This may help to prevent the possibility of drug resistance and improve their services in the future.

They could also be included in providing public health education to rural communities. In terms of ITNs promotion, they could be used as agents for the sale and distribution of insecticide treated nets to rural communities. This may solve the problem of accessibility to remote areas where formal health services or markets have problems reaching. A sort of remuneration package may have to be worked out if they are to sell ITNs at affordable prices to communities they serve.

Willingness to pay does not necessarily translate into ability to pay unless nets are made affordable both in terms of total cost and in relation to payment method to households. People are not currently using health services or seeking prompt treatment because of the cost of hospital treatment. Cases of delayed treatment and the common use of self-treatment are all factors pointing to inability to pay.

The current factory price 13200.00 (US$5.5) for ITNs is well above the mean willingness to pay of 9120.00 cedis (US$3.8) and households are already paying 6% of annual expenditure on routine health care expenses. At the current factory price poor households will be paying 2.2% of annual expenditure per net, which cannot constitute an ability to pay for nets as other essential commodities like food and education may have to be sacrificed. Thus willingness to pay may not necessarily mean ability to pay as it has often been advocated.

The willingness of households to pay for ITNs on an instalment basis also showed inability to pay ready cash for nets. Willingness to pay on a credit basis (amount people were willing to pay) was 1% higher than for households that were willing to pay cash. This shows that amounts households are willing to pay for ITNs could be higher than the mean WTP if alternative payment mechanisms are made available. Exploring payment schemes in communities or within organisations that could be made responsible for sale and collection of payments improve the ability of households to acquire nets.

Prepayment schemes may not be feasible since households want to own nets before continuing any financial commitments.

Other payment schemes available will be to explore women organisations in rural communities which could make deposits or make outright payments for nets and retrieve monies from members. The issue of non-payments have come up where people usually refuse to honour payments but it has become a reality that people in the rural and even urban areas cannot pay outright for nets and insecticides.

However, to counteract non-payment practices, women or even male organisations that are very strong and influential could pay for these nets and then exert peer pressure on members to honour payments if the right promotion of the usefulness of insecticide treated bed nets is carried out.

During the focus group discussions with women, it was mentioned that there are "mangazias", (respectful and strong women leaders), who usually take custody of items such as clothing and cooking utensils that members need but cannot pay cash for them. These items are then distributed to members and the monies collected on a monthly basis. An initial deposit is however required before the items are given out. For people who do not honour payments for two months, the items are taken away from them and they are excluded from subsequent facilities that may be available. These organizations could serve as a potential source of finance for ITNs.

Governments could adopt the local production of insecticide treated bed nets to reduce cost to households.

ITNs may also be promoted by allowing customers to get an extra net free when they purchase a specified number of nets to possibly reduce the cost of buying them in very remote areas if payment mechanisms do not exist. Even in areas where payment mechanisms exist, the very poor would still need to be protected by subsidising nets for this vulnerable group.

Efforts and recommendations from other studies are that, ITNs should be subsidised for children and pregnant mothers who are recognised as the vulnerable group but as this study found out, single parents, especially female headed households and large families are a group that may need consideration for subsidies as well. Female headed households and large households were less likely to use ITNs due to the amount of money they require to purchase ITNs.

While this study has provided valuable information on the willingness and ability to pay for ITNs, further research on improved delivery of existing interventions for malaria is required. This should be complemented by research on what payment mechanisms will be appropriate and affordable to various communities. The fact remains that people do not have ready cash to purchase nets for their households and other household consumption goods. Efforts geared at lessening the economic burden on households should be the focus. Traditional savings schemes exist in a variety of forms in communities including weekly and monthly payments to a central fund and these should be extensively explored to enable people to pay for nets more easily. The effectiveness and feasibility of different payment schemes need to be investigated and the cost associated with implementing these schemes explored.

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APPENDIX I

DESCRIPTIVE STATISTICS

VARIABLE	FREQUENCY	%
Sex ratio		
Female	302	34.5
Male	574	65.5
Area		
Rural	578	66
Urban	298	34.0
Mean age	876	46.6
Ethnicity		
Frafra	806	92.0
Kassem	10	1.1
Dagarti	18	2.1
Other	42	4.8
Marital Status		
Never married	53	6.1
Married	614	70.1
Divorce	21	2.4
Widowed	186	21.2
Other	2	0.2
Mean children alive		3.5
	876	
Sex and Age representation		
Females < 4	217	24.8
Males<4	178	20.3
Female 5-15	470	51.6
Male 5-15	452	46.8
Female-16-39	317	36.2
Male 16-39	387	44.2
Female >40	16	1.8
Male >40	38	4.3
Education		
Primary	170	19.4
Secondary	51	5.8
Tertiary	61	7
Never been to school	594	67.8
Education		
Male	234	40.8
Female	48	15.9
Male-no education	340	59.2
Female-no education	254	84.1

Descriptive statistics continued.....

	Frequency	%
Education		
Primary-urban -rural	76 94	21.5 16.3
Secondary-urban - rural	37 14	12.4 2.4
Tertiary-urban -rural	50 11	16.8 1.9
No education-urban -rural	459 135	45.3 79.4
Occupation		
Farmer	713	81.4
Trader(artisan/trader)	286	32.7
Civil servant	82	9.4
Other(mechanics, repairers, healers)	139	15.9
No occupation(people>70)	15	1.7
Type of occupation and representation by area		
Farmer-urban -rural	161 552	54.0 95.5
Civil service-urban -rural	63 19	21.1 3.3
Knowledge of malaria as a disease	861	98.3
Causes of Malaria		
Sweet foods	284	32.4
Mosquitoes	632	72.2
Oily foods	25	2.9
Sun	78	8.9
Housefly	100	11.4
Cold/wind/swamps	415	47.4
Knowledge of Causes malaria by area		
Sweet food –urban -rural	77 207	25.8 35.8
Mosquito–urban -rural	266 366	89.3 63.3
Oily foods–urban -rural	5 20	1.7 3.5
Sun–urban -rural	6 72	2.0 12.5
Housefly–urban -rural	21 79	7.1 13.7

Descriptive statistics continued.....

	Frequency	%
Signs and symptoms of malaria		
Headache	447	51.0
Hotbody	539	61.5
Vomit	368	42.0
Chills	307	35.1
Fever	122	13.9
Joint pain	133	15.2
Other(stomach ache)	284	32.4
Use of Curative/ Preventive malaria control Measures		
Antimalarials	492	56.2
Mosquito net	138	15.8
Mosquito coil	166	19
Mosquito spray	58	6.6
Strong scented leaves	207	23.6
Use of Curative and Preventive by area		
Antimalarial –Urban -Rural	145 347	48.7 60
Mosquito net-Urban - Rural	71 61	23.8 11.6
Scented leaves-Urban -Rural	39 168	13.1 29.1
Coil-urban -rural	102 64	34.2 11.1
Spray-urban -rural	51 7	17.1 1.2
Other(herbs/screen)-urban -rural	64 156	21.6 27
% of people who Own nets	149	17.0
Number of own net	147	16.8
Reasons for owning nets		
Prevent mosquito bites	136	15.5
Malaria	60	6.9
Nuisance	1	0.11
Luxury	1	0.11
Other	1	0.11
Willingness to buy net	802	91.6

Descriptive statistics continued.....

	Frequency	%
Effectiveness of mosquito control products		
Very effective-untreated nets	104	11.9
-coil	44	5.0
-spray	29	3.3
Moderately effective -untreated nets		
-coil	28	3.2
-spray	111	12.7
-Burn scented leaves	22	2.5
	140	16
Not effective- untreated nets		
-coil	4	0.5
-spray	1	0.1
-burn scented leaves	30	3.4
Reasons for low ownership of nets		
Unavailability	190	21.7
Costly	340	38.8
Unable to use net	2	0.2
Luxury	2	0.2
Other(no money)	275	31.4
% of respondents willing to pay cash		
One net	88	11.0
Two nets	68	8.5
Three nets	8	1.0
Other modes of payment		
Credit	224	25.6
Harvest time	171	19.5
% of people ill in the month prior to survey	508	58.0
Type of illness		
Malaria	252	30.
Diarrheoa	82	9.4
Cough	47	5.4
Other	198	22.6
% that sought treatment	470	53.7
Type of treatment		
Modern	373	42.6
Traditional	63	7.2
Other	44	5.0

Descriptive statistics continued.....

	Frequency	%
Type of Treatment Facility		
Government	267	30.5
Private	104	11.9
Traditional	53	6.1
Other(self-treatment)	67	7.7
Reasons for choice of particular facility		
Government-less expensive	82	9.4
Government-quality service	190	21.7
Government- nearby	26	3
Government-other	13	1.5
Private –less expensive	29	3.3
Private -quality service	27	3.08
Private- nearby	58	6.6
Private- other	4	0.5
Traditional –less expensive	15	1.7
Traditional -quality service	23	2.6
Traditional- nearby	14	1.6
Traditional- other	1	0.11
Other-less expensive	41	4.7
Other-quality	9	1.0
Other-nearby	1	0.1
Other	9	1.0
Other	9	1.0

APPENDIX II

Asset Possession by Household

ASSET	FREQUENCY	%
Bike	313	35.7
Vehicle	69	7.9
Beds	555	63.3
Radio	408	46.6
TV	112	12.8
Sew	161	18.4
Electricity	151	17.2
Traditional lamp	807	92.1
Coal pot	517	59.0
Gas/electric cooker	44	5.0
Zinc roof-urban	291	97.7
-rural	367	63.5
Toilet-urban	132	44.3
-rural	13	2.3
Bike-urban	120	40.3
-rural	193	33.4
Vehicle-urban	59	6.7
-rural	10	1.1
Beds-urban	248	83.2
-rural	306	53.1
Radio-urban	197	66.1
-rural	161	36.5
Television-urban	96	32.2
-rural	16	2.8
Sew-urban	86	28.5
-rural	75	13
Electricity-urban	8	0.9
-rural	143	16.3
Traditional lamp-urban	253	84.9
-rural	554	95.9
Coal pot-urban	260	87.3
-rural	257	44.5
Gas/electric cooker-urban	41	13.8
-rural	3	0.5

Appendix III: A

OLS regression results on maximum willingness to pay and possession of Assets

Variable	Coefficient	P-value
Intercept	7631.769	0.000
TV	-637.183	0.177
Radio	596.792	0.011
Bicycle	215.068	0.252
Utensil	534.176	0.140
Zinc roof	267.828	0.446
Vehicle	108.100	0.772
Sewing machine	564.582	0.036
Toilet1	-365.226	0.443
Traditional lamp	-279.154	0.086
Coal pot	261.6832	0.194
R2=0.042		
Prob>0.0001		

B

Logistic regression of households using untreated nets

Variable	Coefficient	P-value	Probability
Intercept	-2.85539	0.000	-
TV	0.5693281	0.033	0.64
Radio	0.3086895	0.034	0.58
Bicycle	0.2297699	0.033	0.56
Utensil	0.8539242	0.000	0.70
Zinc roof	0.1837183	0.524	0.55
Vehicle	0.2065537	0.319	0.58
Sewing machine	0.661723	0.666	0.66
Toilet1	-0.2480341	0.404	0.43
Traditional lamp	0.1223951	0.241	0.53
Coal pot	0.1251293	0.324	0.53
R2=0.12			
Prob>0.0000			

Appendix V

WILLINGNESS AND ABILITY TO PAY FOR IMPREGNATED BEDNETS SURVEY
HOUSEHOLD HEAD INDIVIDUAL QUESTIONNAIRE

SECTION 1: IDENTIFICATION

LOCALITY NAME: _____ LOCAL
COMPOUND NAME: _____ COMPNAM

NAME OF HOUSEHOLD HEAD: _____ HEAD

ENUMERATION NUMBER:							EANUM
COMPOUND NUMBER :							COMPNUM
HOUSEHOLD NUMBER:							HHNUM
NUMBER OF SLEEPING ROOMS:							SLEEPRM
SEX:							SEX
URBAN/ RURAL (URBAN=1, RURAL=0)							URBRUR
DATE OF INTERVIEW:							DINT
FIELDWORKER'S CODE:							FW
FIELD SUPERVISOR'S CODE:							FS

SECTION 2: Socio-economic and Demographic Characteristics of Respondent:

1.	How old are you now?		AGE
2.	What is your ethnic origin?	Frafra.....1 Kassem.....2 Dagarti.....3 Nankam.....4 Other (specify).....5	ETHNIC
3.	What is your marital status now?	Never married.....1 Married.....2 Divorced.....3 Widowed.....4 Other(specify).....5	CURRMAR
4.	How many of your children are currently alive?		CALIVE
5.	How many of your living children are within the following ages?		

Age	Female	Male
0-4	FCH04	MCH04
5-15	FCH515	MCH515
16-39	FCH1639	MCH1639
40+	FCH40	MCH40

6.	What level of education do you have?	Primary.....1 Secondary.....2 Tertiary.....3 Never been to school.....4	EDUC
7.	What is your occupation?	None.....1 Farmer.....2 Trader/artisan.....3 Civil servant.....4 Other(specify).....5	OCCUP GO TO 9 GO TO10 GO TO11
8.	How much did you earn last year from your farming activities?		FINC
9.	On average how much did you earn per month in the past year?		TINC
10.	What is your monthly salary? (in cedis)		CINC
11.	How much did you earn last year from your activities?		OINC

SECTION 3: GENERAL KNOWLEDGE OF CAUSES OF MALARIA

12.	Do you have any knowledge about pua/fever (malaria)? **(if no, skip to 19)**	Yes.....1 No.....2	KNOWPUA
13.	What do you think causes pua/fever (malaria)?	Eating sweet food.....1 Mosquitoes.....2 Eating oily food.....3 Standing in the sun.....4 Housefly.....5 Other(specify).....6 NA.....8	CUASPUA
14.	How can you tell when someone has pua/fever?	Headache.....1 Hot body.....2 Vomiting.....3 Chills.....4 Fever.....5 Pain in the joints.....6 Other(specify).....7 NA.....8	SYMPUA
15.	What can one do to protect oneself against pua/fever?	Take anti-malarial.....1 Use mosquito net.....2 Use mosquito coils.....3 Mosquito spray.....4 Burn strong scented leaves...5 Other(specify).....6 NA.....8	PROAPUA
16.	Have you ever used the following methods? **(if no to all methods, skip to 19)**	Anti-malarials.....1 2 8 Mosquito net.....1 2 8 Mosquito coils.....1 2 8 Mosquito spray.....1 2 8 B. scented leaves...1 2 8 Other(specify).....1 2 8	ANTIMAT MOSNET MOSCOIL MOSPRAY SCENTLEA OTHER

17.	Ask for cost and number of times used for all methods used in 16	Cost	No. of times used within last month	
1.	Anti-malarial			COSANTIM,TIM
2.	Mosquito net			COSTNET, TIMN
3.	Mosquito coils			COSTCOIL, TIM
4.	Mosquito spray			COSPRAY, TIMI
5	Burn strong scented leaves			COSCENT, TIMC
6	Other(specify)			COSOTHER, TIM

18.	How effective is this measure in protecting you against malaria/ mosquito bites?		
1.	Anti-malarial	Very effective..... .....1 2 3 4 5 6 8	VEFFECT
2.	Mosquito net	Moderate Effect.....1 2 3 4 5 6 8	MEFFECT
3.	Mosquito coils	Not effective.....1 2 3 4 5 6 8	NEFFECT
4.	Mosquito spray	Not sure.. .....1 2 3 4 5 6 8	NSURE
5.	Burn scented leave	DK..... .....1 2 3 4 5 6 8	DK
6.	Other(specify)	NA..... 8	NA

SECTION 4: OWNERSHIP OF AND WILLINGNESS TO PAY FOR IMPREGNATED BEDNETS

19.	Does anyone in this household have a net? **(If no skip to question 22)**	Yes.....1 No.....2 NA.....8	OWNET
20.	What is the main reason why you own a net?	To prevent mosquitoes biting.....1 To prevent malaria.....2 Prevent insect nuisance/noise.....3 To keep warm.....4 Other.....5 NA.....8	REASNET
21.	How many nets do you have in this household?	[ ][ ]	NUMNET **GOTO SEC6**
	(Respondents without nets)		
22.	Do you want to own or buy an impregnated bed net? **(If no, question 31)**	Yes.....1 No.....2 NA.....8	WANTNET
23.	You said you would like to own/buy an impregnated net, why do you not own one now?	Nets not available.....1 Nets too costly.....2 Can't sleep under net.....3 Having net is luxury.....4 Other(specify).....5 NA.....8	NOTOWN
24.	How many nets are you willing to buy?	[ ][ ]	NNET
25.	**Use Bidding Game Approach to ask for maximum amount respondent is willing to pay for one impregnated bed net.**		

BIDDING GAME APPROACH:

Scenario: The net you see is not an ordinary mosquito net but treated with insecticide. By getting rid of mosquitoes and other insects (bed bugs), it will protect you and your family members from mosquitoes and other insects when inside thus allowing you to have a good night's sleep. In addition, it will also reduce the number of episodes of malaria in your household if your household members sleep under these nets each night. On an average, this would reduce the number of times someone in your compound gets malaria, thus saving time and money for your compound , which would otherwise have been incurred, on the treatment of that malarial episode.

As it has insecticide, you may sometimes experience cold-like symptoms, such as headache, running nose, burning eyes and others but this will disappear after the first week. This insecticide is not harmful even to children. The net needs once to twice yearly treatment as its effects wear out with time and you may have to bring to the centre for re-treatment or treat with the itinerant worker that comes to your compound. Remember washing of the treated net reduces its effects.

You are also aware that there are other methods to protect yourself from mosquitoes/malaria. Given this information.

BIDDING QUESTIONS	YES	NO	
Would you be willing to buy an insecticide-impregnated bed net?			**If no, skip to question 31**
Would you be willing to pay ¢1000.00?			
Would you be willing to pay 2000.00?			
Would you be willing to pay ¢3000.00?			
Would you be willing to pay ¢4000.00?			
Would you be willing to pay ¢5000.00?			
Would you be willing to pay ¢6000.00?			
Would you be willing to pay ¢7000.00?			
Would you be willing to pay ¢8000.00?			
Would you be willing to pay ¢9000.00?			
Would you be willing to pay ¢5000.00?			
Would you be willing to pay ¢6000.00?			
Would you be willing to pay ¢7000.00?			
Would you be willing to pay ¢8000.00?			
Would you be willing to pay ¢9000.00?			
Would you be willing to pay ¢10, 000.00?			
Would you be willing to pay ¢11,000.00?			
Would you be willing to pay ¢12,000.00?			
Would you be willing to pay¢13,000.00?			
Would you be willing to pay¢14,000.00?			
Would you be willing to pay¢15,000.00?			
Would you be willing to pay¢16,000.00?			
Would you be willing to pay¢17,000.00?			
Would you be willing to pay¢18,000.00?			
Would you be willing to pay¢19,000.00 and above?			
What is the maximum you will pay?			MAXWTP

26. **check Q24 for X**	You said you are willing to buy X number of impregnated bednets. That means you will pay this amount (multiply number of nets respondent is willing to buy by amount respondent is willing to pay) for all nets you want to buy. Will you be willing to still buy?	Yes.....1 No.....2 NA.....8	TOCOST
27.	Will you be able to afford this amount? **(IF YES, GO TO SECTION 5)**	Yes.....1 No.....2 NA.....8	CANAFFOD
28.	If no, how many can you buy at that price if the nets were on sale?	☐☐	PXALLNET
29.	What mode of payment will you like to use to pay for all the nets required by your family?	Credit.....1 After harvest.....2 Other(specify).....3 NA.....8	PAYMODE
	(Respondents without nets and do not want to buy)		
30.	Why is it that you do not want to buy/ own a net?	Expensive.....1 No money.....2 Net not protective.....3 Other(specify).....4 NA.....8	REANOWN
31.	If you do not use an impregnated net, you are likely to be bitten by mosquitoes and thus get malaria. Knowing the risk of not using an impregnated net, would you want to buy a net?	Yes.....1 No.....2 Not sure.....3 Other.....4 NA.....8	RISKOWN
	(If answer to QN 31 is yes, use bidding game approach If answer is NO, Go To Section 5)		

SECTION 5: BASELINE HOUSEHOLD INFORMATION

1.1 HOUSING:

1.2	Does this household have a modern design? [1.Yes 2. No]	MODI
2.	Does any building in this household have a zinc roof? (EXCLUDING ANIMAL POUNDS) [1. Yes 2. No]	ZROO
2.1	POSSESSIONS:	
2.2	What are the most frequently used cooking utensils?[1. Earth bowls 2. Aluminium pans 3. Plastic pans 4. Earth/aluminium 5. Other]	UTEN
3.	What are the toilet facilities for this household?[1. Free range 2. Pit latrine 3. KVIP 4. Pan latrine 5. W. C. 6. Other]	TOILE
3.1	How many functioning bicycles do this household members own?	BIKE
3.2	How many functioning vehicles normally park in this household or are owned by household members? [Car, tractor, truck, motor-bike]	VEHIC
3.3	How many beds are in this household?	BEDS
3.4	How many mosquito nets are in this household? **(check question 21)**	NETS
3.5	How many functioning radios are in this household?	RADIC
3.6	How many functioning TVs are in this household?	TV
3.7	How many functioning sewing machines are in this household?	SEW
3.8	How many functioning electrical lamps are in this household?	ELECT
3.9	How many functioning traditional lamps are in this household?	TRADI
3.10	How many functioning coalpots/kerosene stove are in this household?	CPOT
3.11	How many functioning gas/electric cooker are in this household?	COOK

SECTION 7: CONSUMPTION AND EXPENDITURE

32.

HOUSEHOLD	**CONSUMPTION**	**/ EXPENDITURE**		
In the last month, did you spend money on any of the following items?	How much did you pay?	Are there things you got in-kind last month?	How much did you get in-kind?	FIELDS
A. Rent				A1 A2
B. Food				B1 B2
C. Soap				C1 C2
D. Salt				D1 D2
E. Clothing				E1 E2
F. Shoes/sandals				F1 F2
G. Kerosene/cooking gas				G1 G2
H. Wood/charcoal				H1 H2
I. Water				I1 I2
J. Electricity				J1 J2
K. Housewares				K1 K2
L. Gifts				L1 L2
M. School fees				M1 M2
N. Transport except health				N1 N2
O. Bicycle/Car/motorbike				O1 O2
P. Radio				P1 P2
Q. Repay debt				Q1 Q2
R. Petrol				R1 R2
S. . Taxes				S1 S2
T. Drinks (beer, pito, gin)				T1 T2
U. Tobacco/kola				U1 U2
V. Family celebrations				V1 V2
W. Others (specify)				W1 W2
Total expenditure				TOTEXP

SECTION 8: HEALTH SEEKING BEHAVIOUR

37.	Has any member of your household been ill in the last month?	Yes.....1 No.....2	MEMILL (ENDINT IF NO)
28.	How many people were taken ill in the last month?		NUMILL
29.	What type of illness was it?	Pua / fever.....1 Diarrhoea.....2 Cough.....3 Other(specify).....4 NA.....8	PUAF DIARR COUGH OTHD
30.	Did you seek any treatment for this/these illness / illnesses?		SEKTREAT
	If no, skip to question 39.		
31.	What type of treatment did you seek?	Modern treatment.....1 Traditional treatment.....2 Other.....5 NA.....8	GOVTF PRAVF TRADF OTHD
32.	Where did you seek treatment?	Government health facility.....1 Private Health facility.....2 Traditional healer.....3 Other .....4 NA.....8	WHYGOVTI WHYPRAVI WHYTRADI WHYOTHEI
33.	Why did you seek treatment at (name) facility?	Less expensive.....1 Quality service.....2 Nearby.....3 Can treat on credit.....4 Other .....5 NA.....8	
34.	Did you pay money for receiving treatment for Any of the people who were ill?	Yes.....1 No.....2 NA.....8	PAYMONEY
35.	Did you pay anything in kind for the treatment?	Yes.....1 No.....2 NA.....8	PAYKIND
	Probe: For item/service		PROITEM
36.	How much would you have paid for such service or item?	_____	PAYITEM
37.	Why did you not seek for treatment	Illness was mild.....1 No money.....2 Other.....5 NA.....8	WNOTREAT

Focus Group Guide for Willingness to Pay Study

1. What are the common illnesses that you have in this area?

2. You mentioned pua as one of the illnesses in this community, what do you think are the causes of pua?

3. What are the symptoms of pua?

4. If a person has pua, how do you treat it?

5. Who are those you think are mostly taken ill by pua?

6. What can you do or use to protect yourself from getting pua?

PROBE:

-Are there other preventive measures that you know that can be used to prevent mosquito bites?

- What are these other preventive measures that you know of?

7. Do people in this community use any of these measures for protecting themselves against mosquito bites?

8. Where can you purchase or obtain these other preventive measures?

9. How effective are these measures in protecting you against mosquito bites?

10. Where do you think you can get a net to buy? Impregnate a net?

PROBE: are there other places you can buy a net from apart from those you have mentioned?

12. Are people in this community willing to buy bednets?

13. What are the reasons why people want to buy bednets?

14. In terms of decision making, who decides on the following

-to purchase housewares

-child health care

-purchase of bed net

15. We have pictures of various household items with us and we would like you to rank them in order of priority with the insecticide treated net and tell us if you had money which would of these items you would buy first.

Items ranked with net

-cooking utensils

-bicycles

-motorbikes

-zinc roof

-tape recorder

-furniture