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**WILLINGNESS TO PAY FOR INSECTICIDE-TREATED MOSQUITO NETS IN
RURAL SOUTH-EAST NIGERIA: AN INTEGRATION OF SOCIO-ECONOMIC
AND SOCIO-PSYCHOLOGICAL MODELS**

Mini dissertation for the degree of Master of Commerce (M.Com), Economics,
Faculty of Commerce, University of Cape Town, South Africa

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PART 0: PREAMBLE

Dedication

To God, for making everything possible; my siblings and all who have brought me smiles.

Thesis Abstract

Malaria is no doubt a severe public health problem especially in sub-Saharan Africa. It is endemic in Nigeria and insecticide-treated mosquito nets have been found to be effective in its control. However, the cost of commercially-sold ITNs in Nigeria is considered to be beyond the reach of many households. Therefore, it is essential to ascertain how much the average rural household is willing to pay for a family-size ITN.

Furthermore, it has been mooted that factors which influence household willingness to pay (WTP) for these nets may not be exclusively economic in nature. This becomes important given the fact that in some cases, even relatively wealthy households are not willing to pay reasonable amounts for these nets. However, most studies on WTP for ITNs have neglected the possible impact of these non-economic factors which may include socio-psychological and ethical aspects of ITN interventions. It is in this context that this study made an attempt to ascertain the extent to which models of WTP behaviour that integrate the theoretical postulates of neo-classical/ socio economics and social psychology predict rural households' WTP. Thus, not only did the study obtain average WTP amount, it assessed the relative performance of socio-economic and socio-psychological models independently and the integrated model (i.e. the integration of both the socio-economic and socio-psychological models) in the determination of WTP. In order to achieve these, ordinary least squares and tests of differences in sample means were adopted.

Acknowledgement

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This acknowledgement will not be complete without mentioning my parents. It would have been nice for you to reap the fruit of your labour, but I am confident that you are happy wherever you are. Thank you. To my siblings, I cannot thank you enough for the love, care and support you have shown me. May God bless you all. Also, to my friends and relatives, thank you for being there for me. In a special way, I acknowledge the love of Chikodi Ihueze.

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PART A: PROTOCOL

WILLINGNESS TO PAY FOR INSECTICIDE-TREATED MOSQUITO NETS IN RURAL SOUTH-EAST NIGERIA: AN INTEGRATION OF SOCIO-ECONOMIC AND SOCIO-PSYCHOLOGICAL MODELS

Background

Malaria is one of the leading causes of morbidity and mortality in Africa in general and sub-Saharan Africa in particular. It accounts for an estimated 1 to 3 million deaths each year (Breman et al. 2006). Also, in reference to Brinkmann & Brinkmann (1991), Onwujekwe et al (2001; pp.545-546) observe that “admissions for malaria account for 20-50% of all admissions in African health services although only 8-25% of persons with malaria visit health services”. It is common knowledge that malaria exerts a debilitating influence on sufferers, hence retarding economic growth and development in countries hard hit by the disease (Sachs, Malaney 2002).

Nigeria is one of the countries worst hit by malaria. Reports suggest that it is the number one cause of morbidity and mortality in the country (Federal Ministry of Health (FMOH) 1992). A UNICEF (2009) report has it that malaria causes the deaths of an estimated 250,000 under-five children annually in Nigeria. The figure is obviously higher when all population groups are put into consideration. Also, malaria prevalence rate in Nigeria is 919/100,000, while it accounts for 40% of disease burden reported at public health facilities, 30% of all childhood deaths, and 11% of maternal deaths as well as a direct loss to the economy of about 132 billion Naira (about US\$1.01 billion at an exchange rate of 130 Naira = US\$1.00) (Uzochukwu et al. 2010).

Various initiatives have been undertaken in Nigeria to achieve the target of prompt access to curative and preventive services to at least 60% of inhabitants set in the Abuja Summit on Roll Back Malaria in 2000. For instance, some of the funds released from the nation’s debt relief agreement with international creditors were spent on purchasing 3 million insecticide-treated bed nets for distribution to pregnant women and children less than five years of age. In addition, the country purchased over 5 million doses of artemisinin-based combination antimalarial drugs and is distributing them free of charge to under-five children throughout the country (Global Policy Forum 2005, Government of Nigeria 2006, McIntyre 2007). However, in spite of these interventions, malaria is still a problem in Nigeria. This is hardly

surprising considering that these interventions are clearly not enough for a population of over 140 million. This state of affairs has prompted questions as to the appropriate issues to be considered in any malaria intervention in Nigeria in such a way that it would be meaningful.

Insecticide-treated mosquito nets (ITNs) no doubt provide an effective means of malaria control (Onwujekwe et al. 2001, Onwujekwe, Hanson & Fox-Rushby 2004, Hanson et al. 2004). However, their impact may not be significantly felt if the vast majority of the population do not possess them. Consequently, a major issue in the current discourse on the use of ITNs for malaria control is how to evolve appropriate mechanisms for the achievement of high level of coverage (Knoor et al. 2009, Grabowsky et al. 2005). Financial involvement of households might be a feasible means of achieving significant coverage. This has become imperative owing to the fact that the high cost of the nets, the state of the Nigerian economy and the recent global financial crisis, might have weakened the capabilities of both the government and development partners to fully bear the economic burden of ITN provision. In fact, ITNs cost between \$3.50 to \$11 in Nigeria (<http://www.netmarkafrica.org/countries/nigeria/>) and thus represent huge financial burden on the government if it is to fully bear the burden of ITN provision.

Rationale and Justification of Research

Given that ITNs have been found to be both efficacious and effective in the control of malaria, it has become important to critically analyse the appropriate policy framework that would ensure near universal coverage. As a result, some questions that one could ask include: should the government provide these nets free of charge, or do households need to join hands with government financially in the provision of the commodity? Though there is a general consensus that the government should significantly increase its commitment to the health sector, it has become obvious that given the state of the nation's economy and the myriad responsibilities of government, coupled with the enormous resource implications of universal (rural) ITN coverage, any policy aimed at significantly reducing the disease burden through ITN provision may require the financial participation of at least some households in order to succeed. Apparently in support of this stance, Hanson, et al (2004; p.iv) aver that "Insecticide-treated nets (ITNs) are a highly cost effective means of preventing malaria, but the high cost of covering the entire population at risk suggests that innovative means of financing and delivering them are needed". Furthermore, the Nigerian case has not been very encouraging. Notwithstanding the fact that "manufacturers' estimates indicate that more than

150 million nets were delivered to African countries during 2004-2008 and are available for use out of 340 million nets needed to achieve universal coverage in areas with malaria transmission” (UNICEF 2009; p.4), Nigeria still performs relatively poorly in ITN coverage compared to many other African countries. In fact, ITN coverage ranged between 20-59% of the population between 2004 and 2008 (UNICEF 2009). It is possible that this is due to low purchasing power of majority of her citizens as well as non-economic factors.

It is in the above context that an attempt to answer the questions, “what maximum amount would the average rural household be willing to pay for these nets?” and “what factors determine willingness to pay (WTP)?” become relevant. Such information would not only be useful in providing an estimate of what (rural) households may be able to pay for the nets, but will also reveal behavioural factors (not necessarily economic) that could be influencing such a decision. This will potentially aid government in setting prices that are affordable to households which will aid decisions on the level of subsidy required (if need be) given the market price, coupled with the required level of education for attitudinal change necessary to achieve better net ownership indices.

The procedure for obtaining such WTP amounts will involve an elicitation of how much households are willing to part with in order to purchase a family-size ITN. The study’s emphasis on rural households is informed by the fact that majority of households (about 70%) still live in rural areas, coupled with the fact that they generally belong to lower socio-economic status (SES) categories when compared to their urban counterparts (Alaba, Alaba 2009). Therefore estimates of average WTP obtained from a combined sample of urban and rural households may not be indicative of what the latter are actually willing to pay.

In terms of relevance, the study is important in that it will try to ascertain the extent to which certain non-economic (socio-psychological) factors independently explain rural households’ WTP for ITNs and how well a model that integrates both the economic and socio-psychological determinants of WTP for ITNs performs. This is important given the emphasis of the World Health Organization (WHO) on a system-wide approach to improving health care delivery (Hutton, Tanner 2004). Furthermore, on the impact of education, most studies have only considered the impact of formal education on WTP for ITNs. While formal education undoubtedly enhances WTP for ITNs, there is hardly any evidence on the impact of disease-specific enlightenment on ITN WTP in rural South-East Nigeria. These issues are the gaps in the literature that the study intends to fill.

It is the author's belief that the findings of the study would aid policy makers in knowing the amount the average rural household may be able to afford for a family-size ITN; the government, non- governmental organizations (NGOs) and development partners, on the amount of subsidy and aid to be granted so as to engender the support of the people in owning these nets. Furthermore, it will throw light on non economic aspects of rural South-Eastern Nigerian households' behaviour that equally deserve attention in order to encourage the ownership of the nets.

BRIEF LITERATURE REVIEW

Previous studies have established a negative association between malaria prevalence and economic growth (Sachs, Malaney 2002, Gallup, Sachs 2001). Even though a lot of debate has continued over the years on the nature of the causality between malaria prevalence and growth, it remains unequivocal that countries with high incidence of malaria have experienced worse growth indices than their non-malarious counterparts. In addition, Nigeria and many other African countries lost about 18% of their 1995 GDP to malaria (Gallup, Sachs 2001). Furthermore, Alaba & Alaba (2009) found that the direct and indirect costs of malaria were \$1.01 million \$50.4 million respectively for rural Nigeria. This is no doubt a very worrisome situation, especially for a developing country.

Consequently, efforts have been made at the global level to reduce the incidence of the disease. These include the establishment of two global initiatives to assist resource-constrained countries to control malaria and other endemic diseases: the WHO Roll Back Malaria partnership and the Global Fund for AIDS, TB and Malaria (Global Fund). Parallel to these developments, there has been increased concern among the global public health community about identifying appropriate means of improving the health status of the poor and reducing inequalities (Onwujekwe, Hanson & Fox-Rushby 2004, Gwatkin 2000). Furthermore, various efforts have been devoted to tackling the disease in Africa (Castro et al. 2004, Lengeler 2004). The collective desire to rid the continent of the disease led to the African Summit on Roll Back Malaria (RBM) held in Abuja, Nigeria in 2000. The Abuja Summit, among other things, committed participating countries to providing prompt access to affordable and appropriate treatment and protective care such as ITNs to about 60% of those at risk of malaria by 2005.

As noted, various studies have found an unambiguous positive relationship between ITN usage and malaria reduction. In reference to Lengeler (2004), Breman et al (2006; p.421) note:

Over 20 studies in Africa and Asia have demonstrated more than 50 percent protective efficacy for individual users of ITNs in reducing malaria episodes, 29 percent protection against severe malaria disease, and substantial protection against anemia.... Most importantly, the use of ITNs reduced child mortality by 18 percent in 5 states in sub-Saharan Africa.

In addition, Breman et al (2006; p.421) report that “one large-scale rural study in Tanzania found that ITNs and untreated nets reduced mortality of children one month to four years, with protective efficacies of 27 and 19 percent, respectively”. Also in a study of the effectiveness of ITNs in the control of malaria in India, Jambulingam et al (2008) found that 74.5- 76.6% of respondents observed reduction of mosquito bites, while there was a 7.2- 32.1% reduction of malaria incidence. Furthermore, almost 100% mortality of vector mosquitoes was recorded on unwashed and washed nets within 10 months of post treatment. Such salutary effect of ITN usage on not only the immediate users has also been underscored by Hawley et al (2003). They note that ITNs not only provide personal protection to users against mosquito bites, but induce positive externalities, whereby a large number of the vector is killed, thereby substantially reducing their longevity and entomological inoculation rate once there is comprehensive ITN coverage of the community. These are no doubt, heart-warming indices of the importance of ITNs as a veritable means of malaria control. Even on a comparative basis, they have been found to be more cost effective than some other control measures against malaria such as mosquito coils (Asante, Asenso-Okyere 2003).

An important issue that deserves consideration in the discourse surrounding ITN provision is their distribution. Onwujekwe et al (2004) note that there has been continuing debate about the specific mechanism through which the target of increasing coverage set in the Abuja Summit on Roll Back Malaria will be achieved. On one end is the WHO Strategic Framework for Scaling-Up ITNs (World Health Organization 2002) which places emphasis on developing commercial distribution systems with subsidies targeted at those who are unable to afford the nets at commercial prices. On the other side are those who argue that the nets should be distributed free of charge since poverty is so widespread among the rural population most at risk of malaria (Guyatt, Ochola & Snow 2002, Curtis et al. 2003). While it

can be argued that a key function of government is to provide essential services (of which prompt and unlimited access to quality healthcare is one) to the citizenry, it is the opinion of this paper that the free distribution of ITNs to everybody (especially in Nigeria) may not be feasible in the near future. This view is supported by the poor state of the economy (GDP per capita was 2199 dollars in 2009) (http://www.indexmundi.com/nigeria/gdp_per_capita_%28ppp%29.html) coupled with the fact that other sectors of the economy, not just the health sector, are also begging for government attention, and the reduction in financial assistance from development partners occasioned by the recent global financial crisis (Arieff, Weiss & Jones 2010). Consequently, strategies for ensuring the availability of these nets at prices affordable to the generality of rural households will likely provide an effective means of achieving practical and sustainable (rural) ITN coverage. On closer examination, it becomes obvious that these two schools of thought (the WHO commercial approach with a combination of targeted subsidies, and the “free distribution school of thought”) may not be as mutually exclusive as they are usually branded. In fact, the fear of the impoverishment effects of ITN payment on malaria sufferers entertained by the “free distribution school of thought” can be addressed by well-designed and transparent policies that will combine substantial subsidies to those who can pay, and free distribution to the poorest and those most susceptible to the disease such as pregnant women and under-five children.

Theoretical Framework

Willingness to Pay (WTP)

This section is divided into three components: firstly, we consider the neo-classical economic¹ approach to WTP. Furthermore, we discuss the theoretical basis for a study of the impact of socio-psychological determinants of WTP, and finally, we make a case for the integration of both economic and socio-psychological WTP models.

(a) Neo-classical Economics

Economists have always been interested in analysing the welfare impact of different policies on the individual or household. The neo-classical theory of consumer behaviour is principally concerned with individuals’ utility maximizing behaviours subject to various constraints, typical of which is income. It is the opinion of Varian (1992) that it is convenient to have a

¹ The terms, neo-classical economics and socio-economics are used interchangeably throughout this study.

monetary measure of changes in consumer welfare, even though utility theory is purely ordinal in nature. In support of this, Ataguba et al (2008) maintain that the interest in obtaining monetary values for any changes in welfare, be they welfare gains or losses due to the availability of a specified public good, or in the case of health or healthcare, changes in the states of health, led to the use of the WTP and Willingness to Accept (WTA) measures, which are often referred to as contingent valuation (CV) methods (Johannesson 1996, Bala, Mauskopf & Wood 1999, Hannemann 1991a, Smith, Olsen & Harris 1999c).

Two of the most common measures of welfare change resulting from price changes are the compensating variation (C) and equivalent variation (E) measures of welfare change. For a price decrease, C can be seen as the maximum amount an individual or household will be willing to part with, or pay to be as well off as she was before the price change (Varian 1992). It is therefore the maximum amount the consumer would lose in order to offset the gain due to the fall in price (Hicks 1943). It is the consumer's WTP for a decrease in price, while it measures her WTA for a price increase. Similarly for a price decrease, E measures the minimum amount a consumer would be willing to accept in order to avoid or forgo the change. For a price decrease, it is the minimum amount required to keep her on the new utility level if the price decrease did not eventually occur. Therefore, it is her WTA for a price decrease, and WTP for a price increase (Mitchell, Carson 1989).

Though both measures have been largely used to analyse the effects of price changes on consumers' welfare, Maler (1974) has shown that they can be readily extended to analyses involving quantity changes such as public goods and even changes in the quality of commodities or changes in the quantities of rationed goods (Hannemann 1991a). This extension is significant given that cost benefit analysts often try to measure welfare changes emanating from different levels of bundles of goods or quality of services such as changes in expected human mortality or morbidity, rather than price changes (Randall, Stoll 1980). Therefore, the maximum amount an individual is willing to pay for a given health intervention (such as an ITN) aimed at improving her state of health gives the value of such an intervention. The amount individuals are willing to pay is often assumed to be additive across individuals within a certain household or community (Ataguba, Ichoku & Fonta 2008, Bala, Mauskopf & Wood 1999, Donaldson et al. 1998) and determined by socio-economic characteristics such as income, educational level, and employment status.

(b) Social Psychology: the Role of Attitudes, Social Norms and Perceived Behavioural Control in WTP Decisions

Cognitive psychologists have recognized the importance of attitude-behaviour models in predicting human behaviour. According to Armitage & Conner (2001), the most widely researched of models that have sought to improve the predictive power of attitudes on actual behaviour are the theories of reasoned action (Ajzen, Fishbein 1980, Fishbein, Ajzen 1975) and planned behaviour (Ajzen 1988, Ajzen, Driver 1991).

According to the theory of reasoned action (TRA), the *intention* to engage in any volitional behaviour is the most proximal (immediate) determinant of such behaviour (Conner, Armitage 1998). This is because intentions (which CV studies seek to measure) are assumed to capture motivational factors which influence behaviour since they depict how much effort individuals are willing to exert or how hard they are willing to try to perform a given behaviour (Ajzen 1991). In this vein, the TRA posits that the formation of an intention with respect to a given behaviour suffices in performing such behaviour. Much as this might sound obvious, the above assertion only holds in situations where the individual in question has complete control over behavioural performance (Conner, Armitage 1998). In other words, if the performance of the behaviour in question requires specialized resources or skills not readily available to the individual (i.e. if it is not an easy-to-perform behaviour), the individual's formation of an intention with regard to such behaviour may not be enough to predict behaviour. Therefore, by maintaining that the mere formation of intention is enough to predict behaviour, the TRA restricts itself to the prediction of behaviours an individual perceives to be easy, i.e. behaviours under volitional control.

Consequent upon the above shortcoming of the TRA, the theory of planned behaviour (TPB) was put forward. In addition to being able to predict behaviour purely under volitional control, the TPB attempts to correctly predict behaviours that require resources and skills not freely available (i.e. non-volitional behaviour) (Armitage, Conner 2001). Thus, it is an extension of the TRA, and as such, it recognizes intentions as central to behaviour prediction.

Though intention is a determinant of behaviour, it has its own determinants. According to the TPB, three conceptually independent determinants of behavioural intention are attitude toward the behaviour (ATB), social norm (SN) and perceived behavioural control (PBC) (Ajzen, Driver 1991). ATB refers to the degree to which the individual favourably or unfavourably evaluates the behaviour. SN refers to perceived social pressure to either

perform the behaviour or not (Ajzen, Driver 1991). It is the degree to which the individual believes that people who occupy a significant position in her life will influence her behaviour in a given situation. PBC on the other hand, refers to the individual's *perception* of the degree to which the performance of the behaviour is easy or difficult (Conner, Armitage 1998). Thus, PBC is the difference between the theories of reasoned action and planned behaviour since it is the component that attempts to predict behaviour that is not under volitional control. Therefore, given a more favourable attitude (evaluation) and social norm with respect to a given behaviour, a greater perception of behavioural control would translate to the formation of a favourable intention to perform the behaviour.

Intentions and behaviour are strongly related when measured at the same level of specificity in relation to the target, action, context and time (TACT) of the behaviour in question and when the time interval is short enough to ensure that *intentions* have not changed (Fishbein, Ajzen 1975, Randall, Wolff 1994). With regard to willingness to pay for an ITN in a rural community, the target may be described as being willing to pay for a family-size ITN; action, efforts made to make a purchase; context, a rural community; while time may be "now".

Finally, though people may hold a number of beliefs with regard to a given behaviour, they may be able to attend to only relatively few of these at any given time (Miller 1956). It is these salient beliefs that ultimately determine intentions and actions. They are behavioural beliefs (which influence attitude toward behaviour), normative beliefs (which determine subjective norms) and control beliefs, which are the basis for perceived behavioural control (Ajzen 1991). Thus, while microeconomic theory postulates that consumers hold complete, invariant and transitive preferences which they seek to maximize often in a static equilibrium framework (Kahneman 1986, Urama et al. 2006), TPB has identified the above factors (i.e. beliefs with respect to ATB, SN and PBC) as the principal determinants of human intentions and behaviour.

(c) Integration of Neo-classical (Socio-) economics and Socio-psychology

The need to integrate these models built by neo-classical economists and cognitive psychologists has been realized by cost benefit analysts (Mitchell, Carson 1989, Ajzen, Driver 1991, Urama et al. 2006, Bateman et al. 2002, Pouta, Recola 2001). While socio-economic factors such as income and educational status are likely to influence WTP, the TPB postulates that socio-psychological beliefs determine intentions. Thus, by focusing on economic determinants of intentions/ behaviour, socio-economic models neglect the possibly

significant impact that these socio-psychological factors can play in the prediction of behavioural intention. Therefore, both theories capture different aspects of human behaviour and their integration aims at achieving better intention/ behaviour prediction. In other words, single domain models (in this case, models that are exclusively socio-economic or socio-psychological in nature) may not yield optimal results with respect to WTP prediction. This proposition was noted long ago by Ciriacy-Wantrup who observed that welfare economics could be made more realistic with cooperation between economics and certain branches of applied psychology (Ciriacy-Wantrup 1947).

Empirical Literature

Several WTP studies have been undertaken on health and health-related interventions by researchers. An appreciable amount of literature exists on estimating the WTP for ITNs as a means of gauging households' demand for them. From these studies, it is evident that the major socio-economic determinants of households' WTP include household income, wealth, employment status, level of education attained, cost of seeking medical care, household size, household composition (number of under 5 children, presence of a pregnant woman in the household), gender of the household head and location of the household (rural or urban).

Guyatt et al (2002) estimated WTP for ITNs in highland Kenya. They found that though households expressed high WTP for the nets (97% of respondents), they lacked sufficient purchasing power to actually purchase them at the going market price. In conclusion, they observed that an option that would have immediate and equitable impact on ITN coverage so as to break the cycle between malaria and poverty was for the nets to be distributed free of charge. However, this policy recommendation remains very challenging, especially for a developing country. In a similar study, Onwujekwe et al (2004) examined inequalities in the purchase of ITNs and WTP for treated nets in a rural area in Nigeria. It was found that though the relationship between perceived risk of malaria and economic status (ES) was not statistically significant, those in higher ES groups owned more untreated nets and purchased more ITNs. Also, respondents in higher ES quintiles exhibited a greater WTP for the ITNs. Though the authors raised some concern about the validity of their asset index, this clearly shows that ability to pay is positively related to WTP. This positive relationship between income level and WTP conforms to theoretical expectations for normal goods.

In a study of the WTP for re-treatment of nets with insecticides in four communities in South-East Nigeria using the bidding game elicitation method in three of the communities and the

“close-ended with follow-up” method in one community, Onwujekwe et al (2000) found that the proportion of those willing to pay for the service ranged between 79% and 91%, while WTP amounts ranged from \$0.05 to \$5.26. Thus the WTP technique is very flexible and can be employed in answering different research questions as the WTP technique has been employed in evaluating not only health interventions but also in the field of environmental economics (Ichoku, Fonta & Kedir 2007, Fonta, Ichoku & Ogujiuba 2009).

Studies that have integrated socio-economic and socio-psychological models in environmental WTP analyses include Urama et al (2006), Spash (2002) and Niemeyer & Spash (2001). However, to the best of the author’s knowledge, literature on health-related WTP is virtually non-existent in this regard.

OBJECTIVES OF THE STUDY

The main objective of the study is to estimate rural households’ WTP for ITNs using the CV methodology.

The specific objectives are:

- (1) To estimate rural households’ WTP for ITNs using the Dichotomous Choice (DC) elicitation format with follow-up questions.
- (2) To determine the factors that significantly affect rural households’ WTP for ITNs using single domain models of socio-economics and social psychology, and the integration of both models.

METHODOLOGY

As noted above, CV is usually employed in the analysis of WTP. Ichoku et al (2007) maintain that CV allows the researcher to measure different kinds of non-use benefits unlike traditional price-based market valuation of consumer benefits. In their opinion, this accounts for the reason why it is being increasingly used in diverse areas of research in both developed and developing countries. As a result, when properly designed, CV closely measures the concept of total economic value. Also echoing its versatility as a research tool, Fonta et al (2009) are of the opinion that its popularity as a technique used in estimating household WTP for environmental improvements is because it is flexible and adaptable to many valuation tasks that alternative economic evaluation techniques cannot handle, coupled with its relative ease of interpretation and use for policy-making decisions.

WTP Models

Data Analysis

Sample selection models will be used to estimate both the mean and median WTP for an ITN as well as factors that significantly determine rural households' WTP decisions. This is due to the possible differences that might exist between respondents with zero WTP and those with positive WTP. If however, no statistically significant difference exists between these two sub-samples, ordinary least squares (OLS) regression will be adopted. In addition, tests of difference of means will be employed. In order to ascertain if socio-psychological variables independently predict ITN WTP, a model that integrates the assumptions of both neo-classical economics and socio-psychology will be developed.

A sample of the derivation of the socio-psychological variables is shown below (Urama et al. 2006, Ajzen 2002):

Measuring Behavioural Beliefs

ATB will be determined by a set of questions on belief strength and their respective evaluations such as:

Behavioural belief strength (b)

My buying (an) ITN(s) now will reduce the threat of malaria in my household

Extremely unlikely: ---1---:---2---:---3---:---4---:---5---: extremely likely

Outcome evaluation (e)

Reducing the threat of malaria is

Not important: ---1---:---2---:---3---:---4---:---5---: extremely important.

There will be similar questions covering the respondent's attitude toward ITNs and malaria in general. Thus,

$$\dots\dots\dots (1),$$

where r refers to the particular belief question/ evaluation; k is the number of belief questions, while i refers to the particular respondent. Here, belief strength and outcome evaluation are measured in a unipolar way with higher numbers corresponding to higher subjective probabilities and more favourable evaluations respectively. A similar structure is adopted for the other questions.

Measuring Normative Beliefs

The logic for assessing normative beliefs is similar to that used in measuring behavioural beliefs; e.g.

Normative Belief Strength (s)

My spouse thinks that I

Should not: ---1---:---2---:---3---:---4---:---5---: should

purchase ITN(s) now.

Motivation to Comply (m)

How much do you want to do what your spouse wants you to do now?

Not at all: ---1---:---2---:---3---:---4---:---5---: very much

Similar questions are posed with regard to each accessible referent. By accessible referents, we mean those individuals and groups that are likely to (directly) influence a respondent’s behaviour. Summing measures of normative belief strength and motivation to comply over all accessible referents gives a snap-shot of perceived social pressures for each individual (Ajzen 2002). Thus:

$$\dots\dots\dots (2)$$

f is the number of accessible referents, while *j* refers to the particular normative question/ evaluation.

Measuring Control Beliefs

These consist of a list of accessible control factors that may enhance or impede the respondent’s WTP for an ITN. For instance;

Control Belief Strength (c)

I can easily afford to pay more for an ITN now

Strongly disagree: ---1---:---2---:---3---:---4---:---5---: strongly agree

Control Belief Power (p)

How much control do you think you have over the decision to pay more for an ITN?

No control: ----1-----:----2-----:----3-----:----4-----:----5-----: absolute control

The control belief power tells us the extent to which the control factor's presence has the power to impede or enhance behaviour. PBC is obtained thus;

$$\dots\dots\dots (3)$$

Eqn (3) is defined similar to equations (1) and (2), with g measuring the number of accessible control factors and l referring to a particular behavioural control question/ evaluation.

Consequently, the modelling process will consist of the following steps:

- (i) Maintaining the strict assumptions of each domain independently (socio-economics and socio-psychology), and (ii) Integration of the both models (INTMOD). The single domain model maintaining the underlying assumptions of neo-classical welfare theory will be denoted by ECOMOD, while its socio-psychological counterpart will be termed PSYMOD.

Study Population

The population is made up of rural areas in Nsukka Local Government Area (LGA) of Enugu State, South-East Nigeria. Nsukka LGA is located in the northern part of Enugu State. It comprises fifteen (15) communities namely: Anuka, Okutu, Ibagwa-agu, Okpuje, Ibagwa-ani, Okpaligbo, Obukpa, Alor-uno, Edem, Obimo, Lejja, Ede-oballa, Opi, Ehalumona, and Nsukka (Ataguba, Ichoku & Fonta 2008). The choice of the study area is informed by its rural nature, coupled with the author's familiarity with the area. The unit of analysis will be the household. This is informed by Dong et al (2004a, 2005) who posit that in eliciting WTP amounts, households, rather than individuals are considered a better enrolment unit since most decisions on consumption and expenditure in a household are done via the family as a collective group.

According to 2006 population census figures, Nsukka LGA is made up of 63,603 households with a population of 309,633 (National Population Commission 2006, National Bureau of Statistics 2007). Unlike previous datasets (National Population Commission 1996), population data is available for only the overall population in the L.G.A. (not for individual communities). Consequently, 2006 population figures for each community were obtained by assuming a constant percentage of overall population across the years for each community, i.e., a community that made up, say 5% of the total L.G.A. population in 1996 was also

assumed to have the same 5% share in 2006². Based on these 2006 population figures, the study extrapolated the 2010 figures accordingly using the 3% national average growth rate of population (Roll Back Malaria 2008). In line with the foregoing, and following Ataguba et al (2008), the respective populations for the various communities are as follows: Anuka (1080), Okutu (5506), Ibagwa-agu (1777), Okpuje (12686), Ibagwa-ani (12929), Okpaligbo (3415), Obukpa (27461), Alor-uno (8957), Edem (22826), Obimo (17460), Lejja (20979), Ede-oballa (19690), Opi (34849), Ehalumona (49486), Nsukka (109428).

To obtain the approximate number of households in each community, we note that, going by the 2006 census figures, the average household size in Nsukka L.G.A. is 5 (i.e. total population / total number of households). Consequently, the approximate number of households in each community can be obtained by dividing the respective communities' populations by 5 to give: Anuka (216), Okutu (1101), Ibagwa-agu (355), Okpuje (2537), Ibagwa-ani (2586), Okpaligbo (683), Obukpa (5492), Alor-uno (1791), Edem (4565), Obimo (3492), Lejja (4196), Ede-oballa (3938), Opi (6970), Ehalumona (9897), Nsukka (21886). The data is cross sectional in nature.

Data Requirements, Sample Size and Sampling Procedure

Usually, contingent valuation studies of this nature require primary data obtained through interviewer-administered structured questionnaires (Smith, Olsen & Harris 1999c). Information to be elicited from respondents include information on household economic variables, health and demographic information, environmental and dwelling characteristics, socio-psychological variables and WTP questions. Follow-up debriefing questions will also be asked.

In line with Israel (1992) and Ataguba et al (2008), the sample size would be obtained using the Yamane (1967) specification:

where “n” is the sample size, “N” is the population size (number of households in the study area) and “e” is the error margin.

Multistage sampling would be employed. In the first stage, the entire L.G.A. will be stratified into urban and rural areas. This is necessitated by the need to remove Nsukka community

² These will be subsequently used to calculate the number of households in each community.

from the population due to the focus of the study on rural areas. This is consequent upon the fact that Nsukka community is predominantly urban (Ataguba, Fonta & Ichoku 2010). This leaves us with 14 rural communities making up the enumeration areas (EAs). Furthermore, 8 communities would be randomly drawn, whereby systematic sampling would be used to select households in such a way as to ensure a probability-proportional to size (PPS) sampling. The choice of this sampling technique is informed by the fact that it adjusts for differences in the respective sizes of the communities and accords each community equal non-zero probability of being selected (McGinn 2004). In a nutshell, the sampling procedure to be adopted is as follows:

- (a) A list of the 14 communities that make up our population and the number of households in each of them would be generated.
- (b) The cumulative size of the population would be calculated.
- (c) The total population would be divided by 8 (the number of communities we want to visit) in order to obtain the sampling interval (SI).
- (d) We then select a random start (RS) which is a number randomly selected between 1 and the SI.
- (e) We then calculate the series: RS, RS+SI, RS+2SI, RS+3SI, RS+4SI, RS+5SI, RS+6SI, RS+7SI to obtain the particular communities to visit. Therefore the communities to be visited are those for which the cumulative population has figures that contain these numbers.
- (f) Consequently, about 50 interviews would be conducted in each selected community.

We note that where a selected community is so large that it contains, say two numbers, that community is counted twice and is assigned twice the number of households to be sampled in an average community. This is to give each household in the population equal probability of being included in the sample. This therefore implies that the number of communities to be visited may eventually be less than 8 (actually, 7 communities will be actually chosen since Ehalumona contains 2 sites by virtue of its population).

(Adapted from (McGinn 2004)).

Excluding Nsukka community, the population of Nsukka L.G.A. is 287747 (made up of 47819 households). Therefore given the above population size (47819 households) and using an error margin of 5%, the required sample size is approximately 397 households. Household heads are to be interviewed. In their absence, their spouse would be interviewed. If the spouse were absent, the next elderly household member would be interviewed if they were up to 20

years old. Suitable household members would adequately represent incapacitated respondents (such as those with hearing disabilities).

Data Collection Instrument

The data collection instrument is an interviewer-administered structured questionnaire that will be translated into the local Igbo language where appropriate. It is divided into six sections. Section A elicits information on enumerators, communities and respondents. Section B includes questions on general household information, while Section C elicits health-related information. Sections D and E elicit information on asset ownership and socio-psychological determinants of WTP for ITNs respectively, while section F presents the WTP questions and scenario.

The choice of the DC with follow-up format over other elicitation formats is informed by Dong et al (2004b) who posit that it is more feasible and appropriate where there is low literacy level (as in the rural population chosen) and the recommendations of the National Oceanic and Atmospheric Administration (NOAA) Panel on contingent valuation (Arrow et al. 1993). Before posing the WTP questions, the main issues surrounding malaria and the effectiveness of ITNs as a veritable malaria prevention tool will be explained to the respondents. Furthermore, they will be reminded of the need to consider their income level as well as current expenditures on other commodities (especially necessities) before giving WTP values. Informed consent will be obtained from respondents and they will be assured of the confidentiality of any information given as well as their anonymity.

Outcome Measure and Explanatory Variables

The variables included in the analysis are largely drawn from existing literature (refer to literature review above). The outcome measure is the average (mean) WTP of rural households. Socio-economic determinants include household income, respondent's level of education, prior knowledge of ITN, and respondent's gender. In line with existing literature, socio-psychological variables include prior knowledge of ITN, respondent's attitude, influence of "significant others" and respondent's perception of behavioural control (i.e. her perception of paying for an ITN as easy or difficult). The reason for including prior knowledge of ITN in both models is that it is rational in both scenarios to assume that respondents who are already conversant with the item being valued prior to the interview are more likely to pay higher given its effectiveness (Urama et al. 2006).

Recruitment of Study Participants

Community heads in each selected community would be informed first about the study. Thereafter, they would be requested to make the necessary announcements concerning the study. Selected households within each community would be visited to inform them of their selection and to obtain their consent. Each participant would also be presented with an introductory letter from my supervisor. Thereafter, they would be requested to arrange convenient time for answering the questionnaires. Trained enumerators will be employed for data collection.

Ethical Issues

There would be minimal risks from participating in this study such as respondents being required to make precious time available in order to answer the required questions as well as divulge confidential information about things like household assets.

Before commencing on data elicitation, the purpose of the study as well as the foreseeable risks to participants (length of time involved and their divulging confidential information) will be explained to them. Furthermore, they would be informed of the non-availability of compensation due to participation. In addition, they would be assured of the confidentiality of any information that they would volunteer. This confidentiality would be enhanced by ensuring among other things, that paper-based records will be securely kept and made accessible only to the study's personnel, use of passwords by eligible study personnel to access computer-based records, as well as the non-inclusion of participants' names in the questionnaires. Thereafter, informed consent would be sought (see informed consent form). Furthermore, the questionnaires and the informed consent forms would be translated into the native Igbo language where necessary. Finally, being a random survey, there will be no explicit inclusion/ exclusion of (vulnerable) respondents. Where a vulnerable respondent (determined by the principal investigator or his designate) falls into the sample, appropriate arrangements would be made to obtain that household's information (see questionnaire).

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PART B: LITERATURE REVIEW

Background

There is no gainsaying the fact that malaria poses significant threat to countries where it is endemic. There exists a negative relationship between malaria and economic growth (Gallup, Sachs 2001, Sachs, Malaney 2002). In spite of the debate over the nature of the causality between malaria and growth, it remains unequivocal that countries with high rates of malaria incidence have experienced more adverse growth outcomes than their non-malarious counterparts even after controlling for factors like initial poverty, economic policy, tropical location and life expectancy (Gallup, Sachs 2001). Another worrisome dimension of the disease is that not only are the direct costs significant, it is accompanied by substantial indirect costs which obviously affect the productivity of sufferers and care givers. Though detailed global estimates of the economic cost of malaria are difficult to come by, Alaba and Alaba (2009) note that direct and indirect costs of malaria in rural Nigeria are \$ 1.01 million and \$ 50.4 million respectively. This shows that malaria is associated with substantial productivity loss.

Different initiatives have been established to assist mostly resource-constrained countries to tackle malaria (and other endemic diseases). These include the WHO Roll Back Malaria (RBM) partnership and the Global Fund for AIDS, TB and Malaria (Global Fund). Furthermore, the collective desire to rid the African continent of the disease led to the African Summit on Roll Back Malaria held in Abuja, Nigeria in 2000. According to a Roll Back Malaria country needs assessment report (Roll Back Malaria 2008), the well-attended summit was a reflection of real convergence of political momentum, institutional synergy and technical consensus on malaria. A major commitment agreed upon by participating countries was to embark on intensive efforts to halve the malaria mortality of Africans by 2010 through the implementation of strategies and actions for RBM. Furthermore, they agreed, among other things, to ensure that at least 60% of those suffering from the disease, particularly children under five years of age and pregnant women would benefit from the most suitable combination of personal and community protective measures such as insecticide-treated mosquito nets (ITNs) and other interventions which are **accessible** and **affordable** to prevent infection and suffering.

The above declaration, which recognizes the effectiveness of ITNs in combating malaria, is congruent with research findings (Lengeler 2004, Breman et al. 2006, Jambulingam et al.

2008). Also, the efficacy of ITNs in Nigeria was first tested in 1992 – 94 by the Federal Ministry of Health in collaboration with the United States Centre for Disease Control and Prevention (CDC) in rural communities outside Nsukka, Enugu State, and the positive results led to calls for a nation-wide implementation of an ITN programme (Roll back malaria secretariat 2008).

However, in spite of the above declarations and commitments, malaria incidence remains high in the continent. The malaria mortality rate for the WHO Africa Region remains the highest, at a regional average of 104 per 100000 population, compared to every other region on the globe (World Health Organization 2010)³. According to a WHO estimate of the causes of death in children, malaria accounted for 8% between 2000 and 2003, while 94% of all such deaths occurred in Africa (Bryce et al. 2005). WHO reports (World Health Organization 2010, World Health Organization 2009) indicate that there were an estimated 243 million cases of malaria in 2008 causing 863000 deaths, mostly of under-five children. Having identified ITNs as effective in combating the disease, the report however notes that despite increases in the supply of ITNs, their availability was far below the level of need almost everywhere, with an indication that only 9 African countries were on course to meet the Millennium Development Goal (MDG) of significantly reducing the malaria burden (MDG 6). Also, the report states that only 17% of under-five children sleep under ITNs in the WHO Africa Region, with the figure for Nigeria substantially lower at 6%. The figure is likely to be even lower for the entire population.

The foregoing indicate that ownership and usage of ITNs are drastically lower than need. In a Netmark baseline study on the use of insecticide-treated materials in Nigeria, (<http://www.netmarkafrica.org/Research/quantitative/NigeriaQuanBaseSum.pdf>), it was found that some of the important factors militating against the use of ITNs were the high cost of the nets and limited access to them. This becomes worrisome given the fact that cost of ITNs range from \$3.50 to \$11 in Nigeria (<http://www.netmarkafrica.org/countries/nigeria/>). Therefore, it has become imperative to ascertain the amount households are willing to pay for the nets so as to avoid catastrophic effects on their wellbeing, and their inability to own such nets. The above statement however does not negate lofty initiatives to distribute the nets free of charge especially to under-five children and pregnant women. While such initiatives are

³ The respective rates for the other regions are: WHO Region of the Americas (0.5); WHO Eastern Mediterranean Region (7.5); WHO South-East Asia Region (2.1); and WHO Western Pacific Region (0.3). The mortality rate for Nigeria is 156 per 100000 population.

commendable, setting affordable prices (as contained in the Abuja Declaration) for the population not covered by the freely-distributed nets will obviously help achieve near universal coverage.

Having noted the negative impact of malaria on development and the effectiveness of ITNs in its prevention, and having observed that the high cost of the nets has adversely affected their ownership, the rest of this review attempts to, among other things, provide the theoretical basis for the use of the CV⁴ methodology in estimating respondents' WTP for the nets as well as the preference of the WTP measure over the WTA measure. Furthermore, the theoretical basis for the incorporation of socio-psychological factors in the estimation of respondents' WTP is presented, coupled with empirical instances of the application of the CV methodology in estimating the value people place on ITNs.

Theoretical Review

A major responsibility of government is to maximize (or achieve substantial improvements in) the welfare of its citizens. Over time, economists have been interested in ascertaining the welfare implications of diverse economic activities and policies as well as in devising measures with which to measure such welfare changes. One of the earlier criteria used in welfare economics was the social welfare function (SWF) criterion. Defined as the summation of the total utility of every individual in a society for different output combinations, the SWF was mainly championed by cardinal utility theorists who believed that utility was measurable in a cardinal sense (Mitchell, Carson 1989). According to this criterion, aggregate welfare is maximized at the point of tangency of the SWF and the production possibility curve (PPC).

With widespread rejection of the cardinal utility theory and the failure of Bergson (1938) and Samuelson (1947) to rebuild the SWF around ordinal utility arguments (see Arrow 1951), economists turned to the Pareto criterion as a new welfare criterion. Implicit in the Pareto criterion is that policy changes which make at least one person better off without making anyone worse off should be implemented since they are Pareto-improving. Though this criterion is undoubtedly less rigorous than the SWF as the SWF specifies only a unique optimal point for the economy on the PPC, Stavins et al (2003) observe that actual Pareto-improvements are perhaps non-existent, resulting in the strict Pareto criterion not being

⁴ For an explanation of CV, WTP and WTA, see "The Contingent Valuation Method" below.

usually taken as a policy guide in spite of its considerable normative appeal. This is because it is difficult to conceive of any policy change that leaves no one worse off. This led economists to seek the potential Pareto-improvement criterion. Using this criterion, a policy is said to be effective if there exists an *opportunity* for those who gain from the policy change to compensate the losers in such a way that after the compensation, one agent is better off, and no agent is worse off (even when such compensation does not actually take place after all).

Benefit-cost analysis operationalizes the Pareto criterion by attempting to place monetary values on the gains and losses of those positively or negatively affected by a given policy. If we assume that agents are rational, have an initial endowment of resources, and are allowed to trade, they would trade back and forth until, conditional on their initial endowments, there are no more possible opportunities left for trade. In this case, the value of the good is the maximum amount an agent is willing to pay for it out of the resources she controls, or the minimum amount the controlling agent is willing to accept in return for giving it up (Mitchell, Carson 1989).

Over time, different approaches have been adopted in measuring the welfare impact of different policies or price (and quantity) changes as the case may be. A popular measure of consumer welfare and benefits is the consumer surplus. Popularized by Marshall, it is defined as the area lying between the ordinary (Marshallian) demand curve and the price line. It represents the difference between the maximum amount a consumer would be willing to pay for a commodity rather than go without it and the amount she actually pays for it, given her income level. In the case of pure public goods (which do not have any price attached to them), it is simply the area below the ordinary demand curve. However, a great drawback of the Marshallian consumer surplus in accurately depicting changes in utility due to price or quantity changes is that utility is not held constant when constructing the ordinary demand curve; rather income is (Samuelson 1947).

In respect of this shortcoming, Hicks (1943) developed alternative monetary measures of welfare change which hold utility constant at the initial level (i.e. the compensating variation), as well as at an alternative level (i.e. the equivalent variation), even as he admitted that these measures and the Marshallian consumer surplus were more or less the same if there

is constant utility of money⁵. For a price decrease, the compensating variation (C) is the maximum amount of income the consumer would lose in order to offset the gain due to the fall in price (Hicks 1943). Thus, it is the maximum amount the consumer would be willing to pay in order to avoid the price change and still be on her original indifference curve. Therefore for a price decrease, C answers the question: at the new price ratio, how much money must be taken away from the consumer to make her as well off as she was when she was facing the initial price ratio? (Varian 1992). It therefore corresponds to the consumer's WTP for a price decrease and WTA for a price increase (Mitchell, Carson 1989). On the other hand, the equivalent variation (E) for a price change measures the minimum amount the consumer would accept, facing the initial price vector so as to be on the alternative utility level. Therefore for a price decrease, E answers the question: at the old price ratio, what is the minimum amount that we should give to the consumer to make her as well off as she would have been, facing the new price ratio if the change did not occur after all? Thus it is the minimum amount required to keep her on a new utility level if the price decrease did not occur. Therefore, it is her WTA for a price decrease, but WTP for a price increase (Mitchell, Carson 1989).

Though these measures (WTP and WTA) were originally used in the analysis of the welfare impact of price changes, Maler (1974) has shown that they can be extended to the case of quantity changes. This extension becomes important because often times in benefit-cost analysis, economists are more interested in obtaining the welfare impact of changes in the bundles of goods, services and amenities consumed by people, rather than price changes (Randall, Stoll 1980). According to Randall & Stoll (1980), the goods affected by different programmes may as a matter of fact be increases and decreases in expected human mortality or morbidity or recreational and environmental amenities, and not necessarily divisible, exclusive goods priced in competitive, well-functioning markets. Similarly, Hanemann (1991a) notes that in a considerable number of empirical analyses, analysts seek to obtain monetary measures of welfare changes not due to price changes, but due to changes in the qualities of commodities, (public) goods and amenities, or changes in the fixed quantities of rationed goods.

⁵When the proportion of income spent on the commodity is insignificant, we can assume constant marginal utility of money.

In terms of quantity or quality changes, C^6 can be defined as the amount of money that would compensate an individual for a change in the quantity or quality of a commodity, say an environmental good or health status, leaving the consumer at her original utility level. For an increase in quality, it is a measure of her WTP for the intervention or programme that brought about such an improvement, while it represents her WTA if there is a quality decline. On the other hand, E is the amount of money required to bring the consumer to a new utility level in the event that the quality change does not occur. It is therefore the change in income that would be *equivalent* to the proposed change in quantity or quality (in terms of its welfare impact) if that change is not implemented. Therefore E represents the consumer's WTA if the proposed change is a quantity or quality improvement, and her WTP to avoid the change if it is a decline. Both the compensating and equivalent variation measures are usually employed when conducting contingent valuation studies. However, it must be stated at this juncture that since policy interest usually lies in ascertaining the potential benefits of different programmes as measured from the consumer's current level of utility, our attention will be focused on the Hicksian compensating variation measure of welfare.

The Contingent Valuation Method⁷

The value attached to the provision of different levels of a particular amenity or service, or of a given programme (which is usually expressed in monetary terms) can be obtained either by directly observing agents' actual choices as revealed through their behaviour with regard to any aspect of the choice problem and estimating preference parameters off such choices, or by using stated information concerning their preferences for the good in question (Carson, Hanemann 2005). The former, which involves the direct observation of individual preferences is called the revealed preference approach, while the latter, which depends on respondents' stated information concerning their choice behaviour is referred to as the CV method. This is because CV usually depends on (is contingent upon) the "constructed market" presented before the respondent. Thus, while revealed preference is based on actual choice, CV relies on "hypothetical market constructs". Therefore, before conducting a CV study, the researcher has to present the scenario(s) relevant to the process of evaluating the given amenity or service. Hence the success or failure of any CV research in providing

⁶ When the object of analysis is the welfare impact of a fixed quantity or quality of an indivisible commodity (as is often the case with environmental goods), the appropriate welfare measures are the Hicksian surplus measures, and not the variation measures, i.e. compensating surplus and equivalent surplus.

⁷ For a detailed treatment of the origin, pros and cons of the contingent valuation methodology, the interested reader should consult the following references: (Mitchell, Carson 1989, Carson, Hanemann 2005, Spash 2008).

relevant answers to the question at hand significantly depends on the appropriateness of the hypothetical market constructed.

In light of the foregoing, the CV methodology has received a lot of criticism, especially from economists (Hanemann 1994b). The major source of criticism is that CV is not based on actual choice behaviour, but on “artificial” scenarios. Furthermore, it is argued that the choice of the features or characteristics of the market constructed in the survey can influence the nature of the valuation estimates obtained. While these concerns may not be totally untenable, it should be noted that CV is quite more flexible than revealed preference techniques as it can be used to determine the value of a given commodity or program in circumstances different from how they are currently being provided. Thus we can create different scenarios for the provision of the good or service different from what currently obtains so as to ascertain the impact of such potential policy changes. This is virtually impracticable when using revealed preference. Again, CV proves to be an important tool in the evaluation of environmental goods and pure public goods that have no price attached to them. Furthermore, revealed preference is not altogether immune from dependence on hypothetical constructs. Thus, revealed preference, according to Hanemann (1994b), is not foolproof, but involves an extrapolation from observation of particular choices to more general conclusions about preferences. Thus, they require substantial reliance on a number of auxiliary assumptions in order to rule out factors that might invalidate such extrapolations. Hanemann therefore notes that these assumptions may not be verifiable if one is restricted to observed behaviour only. For example, it is a well-known fact that in many instances, the price at which demand becomes zero (necessary for the computation of consumers’ surplus) may likely lie outside the range of observed choices and may be estimated inaccurately⁸.

As noted above, the CV method can also be applied in measuring welfare benefits due to different health interventions. In fact, Carson & Hanemann (2005) have observed that stated preference research in the area of health economics encompasses a wide variety of other areas of policy interest such as drug therapy options and discount rates for treatment options, valuation of pharmaceutical services and willingness to pay to reduce time on waiting lists. Fonta et al (2008) note that the application of CV to the health dimension of welfare is deeply rooted in neo-classical welfare economic theory of consumer behaviour. Thus, we can use the

⁸ This does not however mean that CV is assumption-free. However, CV assumptions are usually with respect to distributions and the nature of the survey data collection effort (see Carson, Hanemann 2005).

CV method to solve the individual's utility maximization problem subject to her resource constraint. Therefore we specify the individual's utility function as follows:

$$U = f(G, H) \dots\dots\dots (1),$$

where G represents a vector of non-health market goods, and H, a non-market good. This implies that the individual has preferences for not only the conventional market goods, but a non-market good, H, which can be her health status⁹. It is assumed that the consumer can freely vary G, but takes H as given (Hannemann 1991a, Ichoku, Fonta & Ataguba 2010) . We also assume that $f(.)$ is continuous¹⁰ and non-decreasing in its arguments¹¹ as well as quasi-concave in G. The individual's utility maximization problem is as follows:

$$\max_G f(G, H) \dots\dots\dots (2)$$

Such that

$$\dots\dots\dots (3)$$

where p_i represents the price vector for the market goods, G_i , and y , her income. In line with (Hannemann 1991a), the above problem yields a set of ordinary demand functions,

$$G_i(p, H, y), \dots\dots\dots, \text{ and an indirect utility function,}$$

for the *ith* individual. $v(p, H, y)$ is assumed to possess the conventional properties of an indirect utility function¹² and is also non-decreasing in H. Assume there is a change in H, from, say H^0 to H^1 (which represents an improvement in health status, i.e. $H^1 > H^0$), and given constant p and y the individual's utility function changes from $v(p, H^0, y)$ to $v(p, H^1, y)$. Similar to Maler (1974), the value in monetary terms, of this change in utility occasioned by a given health intervention which leads to health improvement can be represented by the two Hicksian measures: C and E as shown in equations (4) and (5) below:

$$\dots\dots\dots (4)$$

$$\dots\dots\dots (5)$$

⁹ This does not mean that H must be a scalar. Indeed the analysis still holds if H consists of a vector of non-market goods. However, the treatment of H as a scalar suffices for the current analysis.

¹⁰ By continuity, we mean the non-reversal of the individual's preferences at the limits.

¹¹ We are ruling out the presence of "bads" in the utility function.

¹² The properties of $v(.)$ include: (a) Homogeneity of degree zero. (b) Strictly increasing in y and non-increasing in p_l for any l . (c) Continuous in p and y (Mas-collel, Whinston & Green 1995).

(see Ichoku, Fonta & Ataguba 2010).

Thus, since we are considering an improvement. In this case, C measures the consumer's maximum WTP to obtain the change, while E is a measure of her minimum WTA to forgo it. Usually, they are obtained via surveying a representative sample of utility-maximising households and recording either their WTP or WTA for any given policy or intervention. However, as stated above, our focus will be on C. Therefore the value of any intervention aimed at improving households' health status can be obtained in the above manner.

Ichoku et al (2010) note that different elicitation formats used to obtain such values include the dichotomous choice with follow-up questions method, iterative bidding game process, the open-ended method, and other less formal elicitation mechanisms which include the combined use of focus group discussions, in-depth interviews and a general assessment mechanism of whether households are willing to participate in the proposed activity. It should also be noted that, going by existing literature, a(n) individual's/ household's WTP or WTA is determined by an array of factors which are principally socio-economic in nature.

Having noted that the CV methodology holds great promise in the conduct of benefit-cost analysis, and in the words of Mitchell and Carson (1989), provides the only way of directly measuring both WTP and WTA, an issue that has generated a lot of interest in the CV literature is the adoption of an appropriate measure (WTP or WTA) that would provide a better representation of the welfare impact of a *given* programme or the provision of different levels of a commodity or service in any *given* circumstance. Therefore, what determines whether an elicitation question in a CV study is phrased as a WTP or WTA question is purely dependent on the Hicksian consumer surplus measure which the researcher seeks to obtain. Such a choice is dictated by whether the agent in question has the right to buy the good if she wants to enjoy it, or whether she has the right to sell the good in question. In the case of the former, the appropriate measure would be WTP, while the latter connotes WTA. With this in mind, several studies have attempted to ascertain whether there exists any difference between WTP and WTA with regard to the same product or commodity/ intervention (Randall, Stoll 1980, Hannemann 1991a, Hammack, Brown 1974).

In a study of waterfowl benefits, Hammack & Brown (1974) found that respondents' WTA amounts exceeded their WTP amounts by about four times. However, Willig's (1976, 1973) work suggested that they were relatively close, with the difference depending on the size of

the income elasticity of demand for the good whose price changed, and that the Marshallian consumer surplus lay between WTP and WTA. However, this result was noted to apply to policies which changed prices for consumers with well-behaved utility functions, and not to cases where the provision of, say public goods involved quantity changes, or policies where the quantity of the good provided reaches zero. Randall and Stoll (1980) however, extended these bounds developed by Willig to quantity changes. But Mitchell & Carson (1989) observe that in spite of the support lent to Willig's findings by Randall and Stoll, subsequent CV studies have established wide differences between both measures in a way similar to the Hammack and Brown study. This therefore suggests that respondents' reactions to WTP and WTA questions differed; they either gave protest responses or infinite values when posed WTA questions. Though these differences were initially dismissed as "a consequence of methodological weakness", researchers have come to realise that there exist genuine differences between these measures, with subsequent and more innovative experiments still pointing to the existence of such discrepancies (Knetsch, Sinden 1984, Gregory 1986).

Therefore, emphasis has shifted from explaining why CV studies were eliciting wrong WTA figures, to unravelling the reason(s) why such differences exist between them and WTP values. Plausible reasons border on respondents' WTA property rights; their cautiousness due to uncertainty, risk aversion and inadequate time to make optimizing decisions; as well as their assessment of potential gains or losses from a neutral point of view (prospect theory)¹³ (Mitchell, Carson 1989).

However, Haneman (1991a) notes that it is not atheoretical for WTP and WTA to differ for quantity changes, since (unlike for price changes) such differences do not depend only on income effect, but a substitution effect (i.e. the ease with which other privately-marketed goods are substitutable for the fixed commodity in question, while maintaining the individual at a constant level of utility). He further notes that holding income effects constant, the smaller the substitution effect, the wider the difference, and vice versa. Accordingly, he argues that in the limit, if the good in question has virtually no substitute, one's WTP could at most be one's entire income, while one's WTA could be infinite. Furthermore, because

¹³ For a fairly detailed treatment, see Mitchell & Carson (1989).

respondents find the WTA format implausible, they usually have trouble with it (Mitchell, Carson 1989). Consequently, our focus would be restricted to the WTP measure of welfare¹⁴.

Having established the rationale for the use of the CV methodology in general and the adoption of the WTP measure of welfare in particular, and having noted that existing literature principally focuses on socio-economic determinants of WTP, we now shift attention to non-economic determinants of WTP in an attempt to provide a more complete treatment of the subject matter.

Role of Social Psychology in the Determination of WTP: The Theory of Planned Behaviour

Given that socio-economic factors may not be able to exclusively provide a complete explanation of human behaviour (Pouta, Recola 2001, Bateman et al. 2002), this section attempts, among other things, to provide a theoretical justification for the inclusion of non-economic factors in predicting human behaviour. This is aimed at highlighting the manner in which socio-psychological models may complement the above neo-classical economic model in estimating households' WTP (and behaviour in general).

Cost-benefit analysts have increasingly recognized the importance of cross-fertilization between neo-classical economic models and models built by cognitive psychologists and sociologists aimed at predicting human behaviour better (Ajzen, Driver 1991, Urama et al. 2006). Indeed, this link between economics and psychology was noted decades before the widespread use of CV in conducting economic evaluations, when Ciriacy-Wantrup (1947) noted that welfare economics could be made more realistic if a closer cooperation between economics and certain branches of applied psychology was established. However, as noted by Spash (2008), in spite of this early indication of a potential collaboration between economists and socio-psychologists, the use of attitude-behaviour models was roundly criticized by many economists initially. Indeed, he notes that some of the issues given much less frequent explicit coverage in CV studies include the role of ethics and attitudes in the formation of preferences. Furthermore, in making a case for the consideration of non-economic factors in

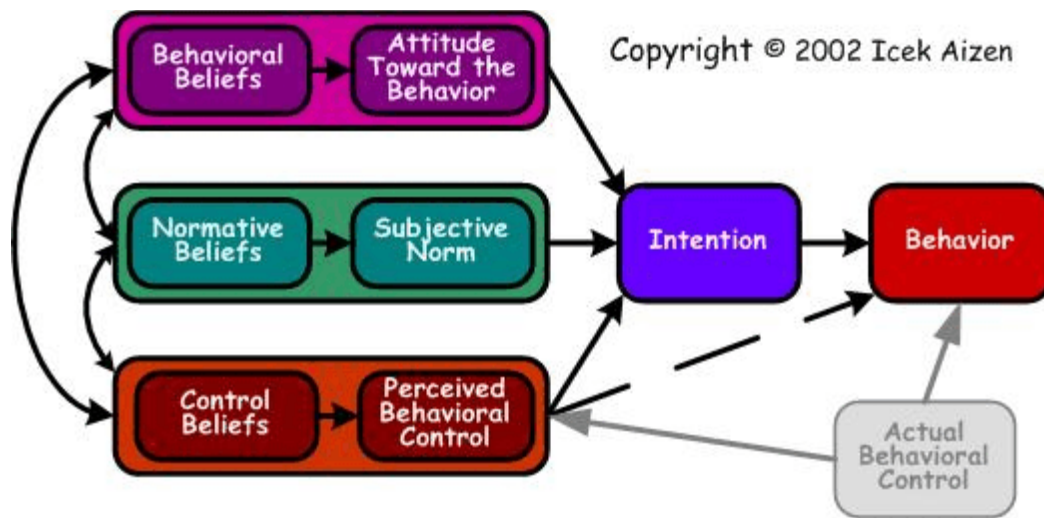
¹⁴ Though one might argue that significant differences might not exist between WTP and WTA for ITNs since there exist many substitutes for it (such as mosquito coils, larvicides and repellents), this study is not in a position to make such guesses, since the substitution elasticity between ITNs and these other products is unknown to the author and does not form part of the study's objectives. Furthermore, such an argument is unlikely to affect the validity of our results since our reference utility is the status quo (necessitating a compensating variation measure), and ITNs lead to improvements in health status (making WTP the required outcome measure).

CV studies, Clark et al (2000) note that the incomplete specification of the change in the commodity being valued, which is a normal feature of CV studies, means that respondents may bring in their own interpretation of the scenario, which implies that researchers might not know with certainty what “good” respondents are trying to value. This, coupled with difficulty of respondents to contextualize a scenario, and how much it might be worth in both monetary and non-monetary terms, and an inability to work out a value for one intervention in isolation from others, has necessitated some probing of respondents’ *motivations*, rather than just drawing inferences, in a bid to understanding why people give the answers they give. In this vein, Spash (2008) notes that motivations might be based upon attitudes and social norms. He therefore hints that extending economic research in this direction might enable better understanding of the reasons for the stated WTP prior to researching the link between stated and revealed WTP (see Spash 1998, 2006).

According to Armitage & Conner (2001), the most widely researched of models built by cognitive psychologists to predict behaviour are the theories of reasoned action (Ajzen, Fishbein 1980, Fishbein, Ajzen 1975) and planned behaviour (Ajzen 1988, Ajzen 1991). The theory of reasoned action (TRA) postulates that the proximal (immediate) determinant of volitional behaviour is an individual’s *intention* to engage in that behaviour (Conner, Armitage 1998). This is because according to the theory, intentions are representative of a person’s *motivation* in terms of their conscious plan to exert effort in order to perform a given task. Therefore, the TRA suggests that behaviour is entirely under the control of volitional behaviour¹⁵, thus restricting itself to volitional control only (Conner, Armitage 1998). This implies that in situations that do not require specialized skills and resources beyond the individual in question, the TRA is likely to perform well in predicting behaviour, since the mere formation of intention would be sufficient to predict a given behaviour in any given circumstance. However, it has been noted (Armitage, Conner 2001, Ajzen 1991) that in situations where the behaviour in question is not fully under volitional control (e.g. when non motivational factors such as the availability of requisite resources play an important role), the mere formation of intention is not adequate in predicting behaviour. It is for the above reason that the theory of planned behaviour (TPB) was introduced. TPB, which is an extension of TRA, allows for the prediction of behaviours that require specialized skills and resources not freely available to the individual.

¹⁵ Volitional behaviour implies behaviour that is easy for the individual to perform.

The Theory of Planned Behaviour (Ajzen, 2002)



Similar to the TRA, the TPB recognizes intentions as very important in predicting behaviour. In other words, the stronger the intention to perform a given task, the higher the probability of carrying out that task, since intentions are assumed to embody the motivational factors which influence behaviour. However, intentions can only predict behaviour well if the person in question can decide at will to perform or not to perform the behaviour. However, an individual's possession of this volitional control is questionable in many situations. This is because an individual will oftentimes form intentions with respect to some given behaviour, but may lack the necessary resources (e.g. time, skills and cooperation of others) and requisite opportunities necessary for the performance of such behaviour (Ajzen 1988). These resources and requisite opportunities represent people's *actual* control over the behavior in question. Therefore, the TPB postulates that the performance of a behaviour not only depends on motivation/ intention (as per TRA), but also on ability (behavioural control). Therefore, holding intentions (motivation) constant, the performance of a behaviour should increase with one's possession of resources (actual control) necessary for its execution. For instance, an individual may form a favourable intention with regard to buying an ITN for family protection. However, if she does not have much control over the purchase of the net (say, in terms of requisite resources, support of family members and time to make the decision), her intention may not translate into action.

Much as the possession of actual behavioural control is important in the execution of a given behaviour (since the availability of resources and opportunities goes a long way in

determining the likelihood of behavioural achievement), *perceived* behavioural control (PBC) is even more important in the prediction of behaviour from a psychological perspective (Ajzen 1991). PBC, which is the difference between the TRA and the TPB, measures an individual's level of confidence in their ability to perform a given action¹⁶. PBC therefore captures the individual's *perception* of the extent to which the performance of the behaviour is easy or difficult (Ajzen 1991). Therefore, together with intentions, PBC *directly* predicts behaviour. This is evident given the fact that if, say two people have equally strong intentions of obtaining immunization against a disease, the one who believes she has the requisite ability to obtain it and/ or that it will not be detrimental to her health status will be able to go for it, more than her colleague who doubts her abilities and/ or the effectiveness of the vaccine. Another reason why PBC is a direct determinant of behaviour is that if it is correctly measured, it can serve as a proxy for actual control (Ajzen 1991). However, Ajzen (1991) cautions that for both intentions and PBC to accurately predict behaviour, a number of conditions have to be met. These include that both measures must be assessed in relation to the behaviour being assessed, i.e. they must be compatible with the behaviour in question. For instance if the behaviour being assessed is "paying for an ITN", the relevant intention should not be in relation to "paying for malaria eradication", but "intention to pay for an ITN". Analogously, the relevant control measure should not be perceived control over "eradicating malaria", but perceived control over "payment for an ITN". Furthermore, PBC can realistically predict behaviour if it is a true measure of actual control. Also, intentions (which CV studies seek to measure) and PBC should remain unchanged within the time that the evaluation is being conducted. In other words, there should be no intervening events that may produce changes in intention or PBC during the period of evaluation. But having said that both intentions and PBC jointly predict behaviour, it should be noted that their relative importance is not static, but varies with respect to the situation and type of behaviour. Thus, in situations where the performance of behaviour is under much volitional control (i.e. easy), intentions should play a more important role in behaviour prediction than PBC, and vice versa.

Having noted the foregoing, it is pertinent to state that though intentions directly predict behaviour, it has its own determinants. These are attitude toward the behaviour (ATB),

¹⁶ PBC is conceptually similar to Bandura's (1982, p.122) *perceived self-efficacy* concept, which "is concerned with judgments of how well one can execute courses of action required to deal with prospective situations".

subjective norms (SN) and PBC¹⁷. Attitude toward the behaviour refers to the degree to which an individual favourably or unfavourably evaluates the behaviour in question. According to Conner & Armitage (1998), the relevant attitudes are those which are assessed at the same level of specificity to that used in the assessment of behaviour. This implies that only attitudes that are directly linked to the given behaviour are to be evaluated when predicting people's actions. On the other hand, subjective norm "refers to perceived social pressure to perform or not to perform the behaviour" (Ajzen 1991; p.188). Subjective norms refer to a person's belief on whether "significant others" are in favour of, or against their performance of the behaviour in question (Conner, Armitage 1998). Therefore, a more favourable attitude and subjective norm, coupled with greater perceived behavioural control should translate into the formation of a favourable intention to perform a behaviour. Just as in the prediction of behaviour, the relative contributions of these factors to the prediction of intention vary across situations and behaviours.

In addition, it is important to state that the theory of planned behaviour not only attempts to predict human behaviour, but to explain it. In this vein, the theory tries not just to deal with the determinants of behavioural intentions, but the antecedents of these determinants. Though an individual may hold a wide range of beliefs with respect to a given behaviour, it is likely that she is going to attend to only a relatively small number of them at any point in time (Miller 1956). It is these relatively small number of *salient* beliefs that are ultimately regarded as the prevailing determinants of an individual's intentions and actions (Ajzen, Driver 1991). Consequently, attitudes toward behaviour are determined by behavioural beliefs; normative beliefs determine subjective norms, while control beliefs, which have to do with one's beliefs about one's access to resources and opportunities that will enable one to perform the behaviour, influence perceived behavioural control. This process of attitude formation is often implemented in an information-processing manner akin to Fishbein and Ajzen's (1975) expectancy-value model of attitudes. In this model, attitudes (for instance) are formed as a result of characteristics associated with a given behaviour. These characteristics (positive or negative) are subsequently evaluated over the range of salient beliefs and the outcome of such evaluation informs the general attitude of the individual with respect to the particular behaviour. Thus, outcomes are quantified as the multiplicative combination of the

¹⁷ This implies that PBC exerts both direct and indirect effects on behavior (Armitage, Conner 2001).

perceived likelihood that performing the behaviour will lead to a particular outcome, followed by an evaluation of that outcome¹⁸.

Though Ajzen (1991) notes that investigations into the role of beliefs as the basis of attitude toward a behaviour, subjective norm and perceived behavioural control have only been partly successful, it should be recognized that by requiring more careful deliberations than responding to global rating scales used to measure attitude, belief-based indices possibly represent a more careful process of arriving at conclusions. Thus, it remains an incontrovertible fact that beliefs influence attitudes (Ajzen 1991). Therefore, the role of people's belief system with regard to being willing or unwilling to pay for health-related interventions deserves an investigation.

In concluding this section, we note that the above review has provided the theoretical justification underpinning the use of the contingent valuation methodology in determining household willingness to pay for various commodities and interventions including ITNs. Furthermore, we have made the case that behavioural intentions (such as WTP for ITNs) may not be wholly explained or predicted by economic factors. This therefore necessitated attempts to explore non-economic determinants of human behaviour by means of a review of socio-psychological models of behaviour (TRA and TPB). These emphasize among other things, that behavioural intention is also dependent on an individual's belief system (which may not as a matter of fact be linked to one's socio-economic status). In the next section, we provide empirical evidence of the use of the contingent valuation methodology in valuing health and non-health commodities as well as applications of the TPB in explaining and predicting human behaviour.

Empirical Evidence

Review of the Application of CV to Non-Health and Health-related Valuations

Several CV studies (Hannemann 1991a, Hanemann 1994b, Ichoku, Fonta & Ataguba 2010, Luzar, Cummings 1998, Ichoku, Fonta & Kedir 2007, Ataguba, Ichoku & Fonta 2008) have been undertaken on the valuation of both non-health and health-related interventions. Furthermore, an appreciable amount of literature exists on estimating the WTP for ITNs as a means of ascertaining households' potential demand for them (Guyatt, Ochola & Snow 2002, Onwujekwe et al. 2000, Onwujekwe et al. 2001, Onwujekwe, Hanson & Fox-Rushby 2004).

¹⁸ An illustration was provided in the protocol.

These empirical instances show the flexibility and adaptability of the CV methodology in value measurement.

On the issue of the existence of disparities between WTP and WTA, Shogren et al (1994) estimated WTP and WTA values for market goods with close substitutes, (i.e. candy bars and coffee mugs), and non-market goods with imperfect substitutes (e.g. reduced health risk). Their methodology is interesting in that they conducted repeated experiments, while respondents were given monetary endowments in both the market and non-market good evaluations (\$3 and \$15 respectively). This might have guarded against Brookshire and Coursey's (1987) concern that wild discrepancies between both welfare measures may well be an artefact of the survey method if there are no market experience and real payments. They found a convergence of WTP and WTA for the market goods, whereas there was a persistent disparity between both measures of value for the non-market good even with repeated market participation and full information on the nature of the good. This result is apparently in support of Hanemann (1991a), who pointed out earlier that divergence between WTP and WTA values may not be an indication of methodological weakness, but a consequence of the degree of substitution between the goods in question.

Another application of the CV methodology in a non-health setting is in Ichoku et al (2007). They estimated individual's WTP for solid waste disposal in Enugu, a South-Eastern Nigerian city, using a relatively novel CV elicitation format, the stochastic payment card (SPC) approach. Using data from a random sample survey of Enugu State, they found a positive and statistically significant association between WTP amounts and respondents' gender, perception of environmental quality, and household income.

In the area of health care insurance, Ataguba et al (2008) applied the CV methodology in estimating the WTP for a community-based health insurance scheme (CBHIS) in rural Nigeria using two elicitation formats: dichotomous choice with open-ended follow up and SPC. They found that factors that positively influenced respondents' decision to participate in the scheme by means of cash contribution included gender, distance to the nearest health facility, and household income. However, for those who preferred using commodities as a payment vehicle, relevant determinants of participation included household size, recent sickness experience, and distance to the nearest health centre. Determinants of WTP amount included wealth measures (for both cash and commodities), knowledge of health insurance (cash) and health status of household head (negative for cash, and positive for commodities).

Results for the mean and variance equations of the SPC were similar to the dichotomous choice elicitation format using cash as a payment vehicle. These results are also consistent with similar CV studies on health care financing (Dong et al. 2003a, Dong et al. 2003b).

Uzochukwu et al (2010) estimated both ex-ante and ex-post WTP for rapid diagnostic tests (RDT) for the diagnosis and treatment of malaria in South-East Nigeria. Ex-ante WTP was assessed by means of household interview of 1020 households with a prior history of malaria, while the assessment of ex-post WTP was conducted at health centres on 618 patients immediately following diagnosis of malaria with RDT. Using the bidding game elicitation format, they found that, for the ex-ante WTP, 51% of respondents in urban areas and 24.7% of those in the rural areas were willing to pay for RDT, with mean WTP amounts of 235.49 Naira and 182.05 Naira respectively. However, for the ex-post WTP, 89% and 90.7% of respondents in rural and urban areas respectively were willing to pay for the service. Expectedly, rural ex-post mean WTP amount was higher than ex-ante WTP, with respective amounts of 296.28 Naira and 182.05 Naira. These findings largely conform to expectations. However, though the authors acknowledged that consumer's attitudes can influence monetary valuation, this was not explicitly accounted for in the analysis.

Just as CV has been employed in evaluating different aspects of health care provision, copious instances exist on its application in valuing ITNs. In most studies reviewed, majority of respondents indicated their WTP for the nets.

Guyatt et al (2002) estimated WTP for ITNs in highland Kenya. Employing both the open-ended and "take-it-or-leave-it" elicitation formats, they found that 97% of respondents were willing to pay for the nets. However, in spite of this high percentage of respondents willing to pay for the nets at different prices, they found that majority of households lacked sufficient purchasing power to purchase the nets at the going market price of US\$8.42. A similar trend was found by Legesse et al (2007) in a study of people's WTP for long-lasting ITNs in Western Ethiopia. They found that though 96% of respondents were aware that long-lasting ITNs were important for family protection against malaria, only 67% of respondents were willing to pay the starting bid of 25 Birr. In the paper by Guyatt et al, factors found to significantly influence WTP for nets for households with some experience of ITN ownership included prior purchase of an ITN at a highly subsidized price (negative), and possession of a radio set, which is an index of relative wealth (positive). Also, they observed that for households who did not own any ITN, the most frequently cited reason was financial. This,

according to them, suggested that cash availability was a problem militating against ITN ownership. Cash constraint as an impediment to people being willing to pay for nets has also been noted in Onwujekwe et al (2001). In conclusion, the authors noted that an option that would have immediate and equitable impact on ITN coverage so as to break the cycle between malaria and poverty was for the nets to be distributed free of charge. However, this policy recommendation remains very challenging, especially for a developing country like Kenya.

In another study, Onwujekwe et al (2004) explored the equity implications of ITN distribution programmes that were based on user charges. They conducted two separate surveys (conducted one month apart). One was used in determining past purchases of untreated nets as well as respondents' stated WTP for ITNs, while the second survey, which was accompanied by actual sale of ITNs, was used to determine actual WTP for the treated nets. Systematic random sampling was used to select households for interview, and the same households interviewed in the first survey were presented with actual sale offers in the second survey. The results show that the poorest economic status (ES) quintile owned the fewest number of both untreated and treated nets, while the highest ownership figures corresponded to the highest ES quintile. An interesting result was that stated WTP was positively related to actual purchases of the ITNs. Though the study found that the WTP technique could explain about 75% of actual WTP, findings from other studies have been more conservative, with the corresponding figures approximately 50% in Mozambique (Dgedge et al. 1999) and the Gambia (Rowley, Cham & Pinder 1999). Other variables that were positively associated with stated WTP for ITNs included having formal education, respondent being male and presence of many residents in the household.

So far, it is apparent that the explicit incorporation of socio-psychological variables in ITN CV studies is lacking.

Few studies have however integrated both economic and socio-psychological models in a bid to obtain a more robust estimate of WTP. Urama et al (2006) estimated an integrated model to predict and estimate WTP for biodiversity restoration in Scotland using data collected from face-to-face interviews. They first estimated single-domain models of neo-classical economics, social psychology and ethics, then considered pair-wise combinations of the models, and eventually built a model that fully integrated the three models. In the single domain models, they found that socio-psychological factors (i.e. ATB, SN and PBC)

outperformed ethical and neo-classical economic models in explaining public disposition to pay for biodiversity restoration, as they were associated with higher odd ratios. In particular, specific attitude toward payment for the restoration of biodiversity was the most significant driver of WTP. Also, ATB, SN and PBC had a negative impact on WTP. In the fully integrated model, only respondent's age and educational class were significant among the socio-economic variables, while all the socio-psychological variables were statistically significant. Given that the coefficients of the socio-psychological variables were least affected by the integration, they concluded that the TPB model was the most robust of the single domain models. But the authors' interpretation of the coefficients of the logistic models as absolute probabilities may not be ideal as they represent odd ratios. Given that most socio-psychological models concentrate on mere comparisons of cross correlations between the outcome of interest and the TPB variables (Armitage, Conner 2001, Ajzen 1991, Ajzen, Driver 1992), the study's attempt at explicitly investigating the impact of socio-psychological factors in determining WTP for a given intervention within a multiple regression framework is commendable. Similarly, Ryan & Spash (2010) used an ordinary least squares model to analyse the impact of attitudes on LNWTP¹⁹. However, contrary to Urama et al (2006), their results implied that attitudinal scales cannot be used to explain a significant portion of variance in the amount offered by positive bidders. Furthermore, the correlations between positive LNWTP and attitude scales (measuring ATB and SN) were low. The differences between the findings of these two studies may be an indication of the context-specific nature of CV methodology and TPB applicability.

In conclusion, we note that the CV methodology, albeit plagued by methodological challenges, has proved to be a reliable methodology for value measurement. The fact that the findings of these studies largely conformed to expectations goes a long way to confirm the validity of findings arising from the CV method. A cursory survey of existing literature reveals that the methodology is flexible, as it can be adapted to different contexts with relative ease. However, as noted by Mitchell & Carson (1989), such flexibility is potentially detrimental if appropriate care is not taken in the design and implementation of the study. Therefore, it is important that the specific context of a particular study be taken into consideration and unnecessary generalizations avoided when undertaking CV studies. Furthermore, it has been shown that socio-psychological factors are likely to play a

¹⁹ LNWTP means the natural log of WTP.

significant role in WTP determination. In the light of these findings, we hereby advocate the incorporation of socio-psychological predictors of WTP in CV studies.

Identified Gaps

Based on the above review, the following gaps are evident with respect to ITN WTP research in rural South-East Nigeria:

- (1) The impact of socio-psychological determinants of WTP has been hitherto unaccounted for. Thus, evidence on the performance of models that integrate both socio-economic and socio-psychological theories is mainly lacking.
- (2) On the impact of education, most studies have only considered the impact of formal education on WTP for ITNs. While it is incontrovertible that formal education enhances WTP for ITNs, there is hardly any evidence on the impact of malaria-specific enlightenment on ITN WTP.

These are the major gaps that the study intends to fill.

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PART C: JOURNAL MANUSCRIPT

Integration of Socio-economic and Socio-psychological models in Estimating Willingness to Pay for Insecticide-treated Mosquito Nets: a Case Study of Rural South-East Nigeria

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Abstract

Malaria is endemic in Nigeria, and insecticide-treated mosquito nets (ITNs) have been found to effectively control its incidence. However, ownership of ITNs is low in rural Nigeria and commercially-delivered nets are expensive. Therefore, the study's aim was to ascertain the amount rural households in South-East Nigeria are willing to pay for a family-size ITN as well as principal determinants of ITN willingness to pay (WTP). Consequently, it was hypothesized that not only will variables from independent socio-psychological and socio-economic domains/ models independently determine ITN WTP, their integration will achieve better results. The contingent valuation (CV) technique was employed. Single domain models of WTP behaviour based on economic theory and social psychology were specified. Eventually, both models were integrated. Sample selection and ordinary least squares (OLS) regression models and tests of differences in means were employed in data analysis. With respect to the socio-economic domain, enlightenment on malaria prevention, age and prior ITN ownership were some of the factors that significantly predicted WTP. For the socio-psychological domain, prior knowledge of ITNs, respondents' attitude toward buying ITNs and their perceptions with regard to their ability to buy the ITNs significantly predicted WTP. The integrated model had stronger statistical properties and largely replicated the results obtained from the individual domains. Households with more members, more educated respondents and those who knew where ITNs were sold were willing to pay higher prices for an ITN. Mean WTP from the integrated model was NGN463.09 (\$3.05)ⁱ. It is the opinion of the authors that integrated models of ITN WTP be adopted rather than models that exclusively focus on socio-economic determinants of WTP.

Key words: Nigeria. ITN. WTP. Theory of Planned Behaviour. Integration.

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Introduction

It is a well-known fact that malaria poses significant threat to countries where it is endemic as there exists a negative relationship between the disease and economic growth (Gallup & Sachs, 2001; Sachs & Malaney, 2002). It accounts for an estimated 1 to 3 million deaths each year (Breman et al., 2006).

Insecticide-treated mosquito nets (ITNs) have been found to be both efficacious and effective in preventing infection and reducing the incidence of the disease (Breman et al., 2006; Lengeler, 2004; Jambulingam et al., 2008). It was in line with similar findings that the African Summit on Roll Back Malaria (RBM) committed member nations to ensure the provision of ITNs to at least 65% of their populations by 2010. However, in spite of this commitment and research findings and despite increases in the supply of ITNs, ITN availability is far below the level of need almost everywhere in Africa, while only 9 African countries are on course to meet the Millennium Development Goal (MDG) of significantly reducing malaria burden (World Health Organization, 2009; World Health Organization, 2010). Also, the reports state that only 17% of under-five children sleep under ITNs in the WHO Africa Region, with the figure for Nigeria substantially lower at 6%. The figure is likely to be even lower for the entire population.

Various factors have been adduced as the reasons for the low level of ownership and use of these ITNs, prominent among them being cost. A NetMark baseline study on the use of insecticide-treated materials in Nigeria found that factors militating against the use of ITNs include the high cost of the nets and limited access to them (<http://www.netmarkafrica.org/Research/quantitative/NigeriaQuanBaseSum.pdf>). In Nigeria, ITNs cost between \$3.50 and \$11 (<http://www.netmarkafrica.org/countries/nigeria/>). Consequently, it has become imperative to not only obtain a correct estimate of households' average willingness to pay (WTP) for these ITNs, but also ascertain salient factors that influence their WTP decisions. Though previous attempts have been made in this direction, the current study tried to enlarge the scope of such research as well as obtain more robust parameter values for determinants of WTP as well as average WTP.

In obtaining households' WTP, the contingent valuation (CV) methodology was adopted. Based on the recommendations of the National Oceanographic and Atmospheric Administration (NOAA) Panel on CV (Arrow et al., 1993), the dichotomous choice (DC) format with open-ended follow-up question was employed. However, debriefing questions

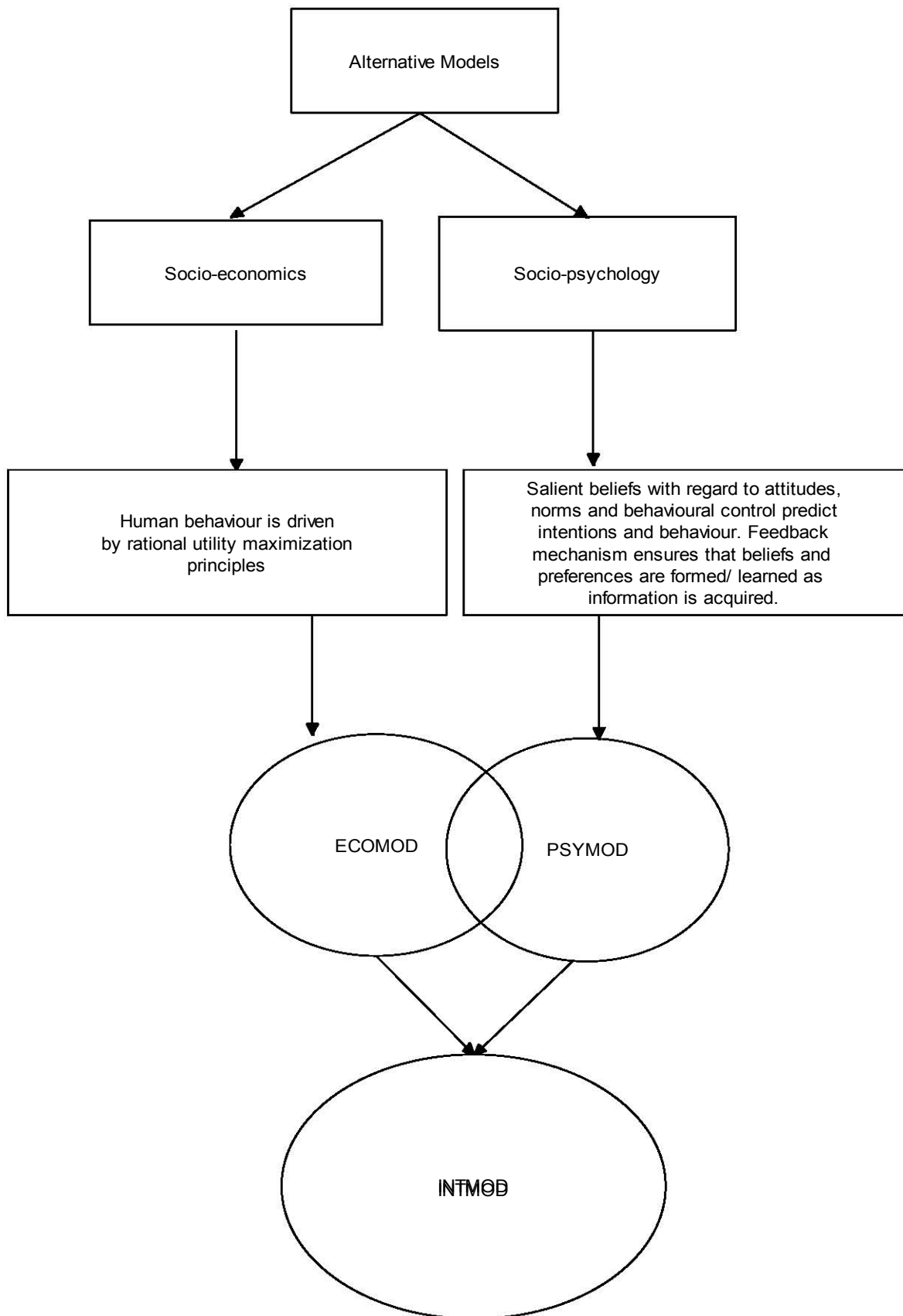
were used to ascertain respondents' reasons for not being willing to pay. Also, the growing complexity of human interaction has brought to question the widely held belief that only socio-economic factors significantly influence WTP. A growing body of literature has ascertained that at least socio-psychological factors exert significant impact on human behaviour, including household WTP for any commodity/ service (Ajzen & Driver, 1992; Urama et al., 2006). This formed a major concern of the current study. Furthermore, the study investigated whether malaria-specific enlightenment had any impact on household WTP for ITNs.

1. Materials and Methods

Conceptual Framework

In this framework, we present two contending models of human behaviour in an attempt to explain household WTP behaviour: neo-classical/ socio- economics and socio-psychology. Both models aim at predicting human behaviour and in fact have been employed in estimating WTP (Ajzen & Driver, 1992; Hannemann, 1991a; Hanemann, 1994b). However, it has been argued that more robust results would be obtained by their integration as both models capture different aspects of human behaviour in general and with regard to WTP behaviour in particular (Urama et al., 2006; Spash, 1998; Spash, 2006).

Fig 1: Conceptual Frameworkⁱⁱ



Neo-classical Economics

Obtaining correct estimates of the impact of various policy changes has been a major preoccupation of economists. A common assumption is that an agent seeks to maximize utility subject to a budget constraint. In other words, given available income/ resources, she chooses bundles of goods and services that give her the highest possible utility. In this sense, it is assumed that the agent is fully rational, possesses perfect information on the prevailing market conditions and is only governed by self interest. Consequently, her utility function is entirely independent of the preferences of others. Furthermore, microeconomic welfare theory suggests that individuals possess complete, transitive and invariant preferences which they seek to maximize often in static equilibrium conditions (Urama et al., 2006; Kahneman, 1986).

Cost benefit analysts have developed different metrics for measuring changes in utility associated with different commodities. Following Hicks (1943), two popular measures are the compensating and equivalent variation measures of welfare. For a price decrease, the compensating variation is the maximum amount the consumer would be willing to pay in order to avoid the price change and still be on her original indifference curve. Therefore for a price decrease, compensating variation answers the question: at the new price ratio, how much money must be taken away from the consumer to make her as well off as she was when facing the initial price ratio? (Varian, 1992). It is therefore her WTP/ willingness to accept (WTA) for a price decrease/ increase respectively. Equivalent variation on the other hand is the minimum amount required to keep the consumer on an alternative utility level if a price decrease did not eventually occur. It is her WTA (WTP) for a price decrease (increase) respectively.

However, Maler (1974) has shown that these measures can be extended to quantity changes. This becomes essential since economists are often interested in measuring the welfare impact of changes in bundles of goods or quality of services/states such as changes in expected human mortality/ morbidity (Randall & Stoll, 1980). For quantity or quality changes, compensating variation is the change in income that would compensate an individual for a change in the quantity or quality of a commodity, say an environmental good or health status, leaving the consumer at her original utility level. For an increase/ improvement in quality, it measures her WTP for the intervention or programme that caused such an improvement, while it is her WTA if there is a quality decline. Equivalent variation can be defined in a way

analogous to a price change. However, given that we are interested in measuring the value of a commodity that results in improvement of health status, our interest would be on the compensating variation welfare measure.

Thus from an economic point of view, and taking the household as the unit of analysis, WTP for ITNs can be seen to represent the economic value the household places on the commodity given the improved health status that would result from its ownership. As a result, its possible determinants include household income and other factors related to the household socio-economic status. This is because for each unit of the commodity, the household will offer to pay an amount that maximizes its utility subject to its budget constraint.

Role of Social Psychology in the Determination of WTP

Cognitive psychologists have underscored the importance of attitude-behaviour models in predicting human behaviour. The most researched of these models are the theories of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and planned behaviour (Ajzen, 1988; Ajzen, 1991). The theory of reasoned action (TRA) postulates that the proximal determinant of volitional behaviour is an individual's *intention* to engage in that behaviour (Conner & Armitage, 1998). This is because intentions represent an individual's *motivation* in terms of their conscious plan to exert effort in order to perform a given task, and are assumed to capture the motivational factors that influence a given behaviour (Ajzen, 1991).

Intentions (which CV studies seek to measure) and behaviour are strongly related when measured at the same level of specificity in relation to the target, action, context and time (TACT) of the behaviour in question and when the time interval is short enough to ensure that *intentions* have not changed (Fishbein & Ajzen, 1975; Randall & Wolff, 1994). It should however be noted that a behavioural intention can only be translated into behaviour if the behaviour in question is under volitional control, i.e. if the decision on whether or not to engage in the behaviour can be made by the individual at will (Ajzen, 1991). Therefore, by focusing on such easy-to-perform tasks, the TRA posits that the mere formation of an intention is sufficient to predict behaviour.

The theory of planned behaviour (TPB) (which is an extension of the TRA) attempts to predict even behaviours that require specialized skills, resources and opportunities that are not freely available (i.e. non-volitional behaviours), which are poorly predicted by the TRA

(Fishbein, 1993) though it recognizes that intentions are still central in behaviour prediction. We note however that though intention ultimately predicts behaviour, it has its own determinants. According to the TPB, the determinants of behavioural intention are attitude toward the behaviour (ATB), subjective norm (SN) and perceived behavioural control (PBC). ATB refers to the degree to which the individual favourably or unfavourably evaluates the behaviour. SN deals with perceived social pressure to either perform the behaviour or not (Ajzen, 1991). It refers to a person's belief on whether "significant others" are in favour of, or against the performance of a given behaviour, while PBC refers to the individual's *perception* of the degree to which the performance of the behaviour is easy or difficult (Conner & Armitage, 1998). Thus, PBC is the significant difference between the TRA and TPB since it predicts difficult-to-perform behaviour. Consequently, a more favourable attitude and subjective norm, coupled with greater perception of behavioural control should translate into the formation of favourable intention to perform a given behaviour.

Though an individual may hold a number of beliefs concerning a given behavioural intention, it is likely that she is only going to attend to a relatively small number of them at any point in time (Miller, 1956) and it is these relatively small number of *salient* beliefs that are ultimately regarded as the determinants of intentions and actions (Ajzen & Driver, 1991). Consequently, ATB is determined by behavioural beliefs, normative beliefs determine SN, while control beliefs, which have to do with one's beliefs about one's access to resources and opportunities that will enable one perform the behaviour, influence PBC. In a manner akin to Fishbein and Ajzen's (1975) expectancy-value model of attitudes, this process of attitude-formation is usually implemented in an information-processing manner. Here, outcomes are quantified as the multiplicative combination of the perceived likelihood that performing the behaviour will lead to a particular outcome, followed by an evaluation of that outcome.

Towards Robust Outcomes: Integrationⁱⁱⁱ

The importance of cross-fertilization between these models built by neo-classical economists on the one hand and cognitive psychologists and sociologists on the other, has been increasingly recognized by cost-benefit analysts (Urama et al., 2006; Ajzen & Driver, 1991; Mitchell & Carson, 1989). Indeed, Ciriacy-Wantrup earlier noted that welfare economics could be made more realistic if a closer cooperation between economics and certain branches of applied psychology could be established (Ciriacy-Wantrup, 1947). However, in spite of these suggestions, relatively few studies have built models that combine the postulates of

both theories. Since socio-economic and socio-psychological models capture different aspects of human behaviour, their integration forms a major thrust of this study.

Model

CV surveys are often plagued by “nay” responses. This phenomenon may either be the result of respondents’ ignorance or perception of some questions as unethical or invasive of their privacy (Strazzera et al., 2003a). Thus, respondents who show interest in a given programme but are not willing to contribute due to disagreement with, say some aspect(s) of the design of the payment mechanism are termed protesters. In some situations, it might be that some respondents are truly averse to the amenity in question. Such respondents are classified as true zero bidders. Thus, when using the “DC format with open-ended follow-up question” to elicit WTP responses, it is necessary to use de-briefing questions to categorize zero WTP responses into true and protest zeros. This is important given the fact that failure to identify at least protesters (and include them in the analysis) is likely to lead to sample selection bias if the sub-sample of protesters is significantly different from the sub-sample of those with positive WTP amounts (Strazzera et al., 2003a; Shyamsunder, 1996; Jorgenson & Syme, 2000; Halstead et al., 1992). This will necessitate the use of sample selection models to provide correct estimates of model parameters. If on the other hand there is no significant difference between both sub-samples, ordinary least squares (OLS) regression provides consistent estimates of the WTP equation.

Study Population

The study population was made up of rural areas in Nsukka Local Government Area (L.G.A.) of Enugu State, South-East Nigeria. Nsukka LGA comprises fifteen (15) communities namely: Anuka, Okutu, Ibagwa-agu, Okpuje, Ibagwa-ani, Okpaligbo, Obukpa, Alor-uno, Edem, Obimo, Lejja, Ede-oballa, Opi, Ehalumona, and Nsukka (Ataguba et al., 2008). The Nsukka people belong to the Igbo ethnic group of South-East Nigeria.

The unit of analysis was the household. This was because most decisions on consumption and expenditure in a household are done via the family as a collective group (Dong et al., 2004a; Dong et al., 2005). Nsukka LGA is made up of 63,603 households with a population of 309,633 (National Population Commission, 2006; National Bureau of Statistics, 2007). Unlike previous datasets (National Population Commission, 1996), information on the number of households in each community is not currently available. Consequently, 2006

population figures *for each community* were obtained by assuming a constant percentage of overall population across the years for each community, i.e. a community that made up, say 5% of the total L.G.A. population in 1996 was also assumed to have the same 5% share in 2006. Based on these figures, the study extrapolated the 2010 figures accordingly using the 3% national average growth rate of population (Roll Back Malaria, 2008). Based on the above procedure, and following Ataguba et al (2008), the respective populations for the various communities were as follows: Anuka (1080), Okutu (5506), Ibagwa-agu (1777), Okpuje (12686), Ibagwa-ani (12929), Okpaligbo (3415), Obukpa (27461), Alor-uno (8957), Edem (22826), Obimo (17460), Lejja (20979), Ede-oballa (19690), Opi (34849), Ehalumona (49486), Nsukka (109428). Going by the 2006 population census figures, the average household size in Nsukka L.G.A. was 5 (i.e. total population/ total number of households). Consequently, the respective number of households in each community was obtained by dividing each community's population by 5 to yield: Anuka (216), Okutu (1101), Ibagwa-agu (355), Okpuje (2537), Ibagwa-ani (2586), Okpaligbo (683), Obukpa (5492), Alor-uno (1791), Edem (4565), Obimo (3492), Lejja (4196), Ede-oballa (3938), Opi (6970), Ehalumona (9897), Nsukka (21886).

Sample and Sampling Procedure

In line with Israel (1992), the Yamane (1967) specification was used, i.e.

where “n” is the sample size, “N” is the population size (number of households in the study area), while “e” is the level of precision (error margin). Excluding Nsukka community, the population of Nsukka L.G.A. was found to be 287747 (made up of 47819 households). Therefore given the above population size (47819 households) and using an error margin of 5%, the required sample size was approximately 397 households.

Multistage sampling was used to select the required sample. Due to the need to sample only rural communities, the first stage involved the stratification of the entire L.G.A. into urban and rural areas so as to remove Nsukka Community from the sample since it was adjudged an urban area (Ataguba et al., 2010). Then 8 communities were selected from the remaining 14 via a probability-proportional-to-size (PPS) sampling procedure. The choice of this sampling technique was informed by the fact that it adjusts for differences in the respective sizes of the

communities and accords each community equal non-zero probability of being selected (McGinn, 2004) (7 communities were actually chosen since Ehalumona contained 2 sites by virtue of its population). In the second stage, about 50 households were randomly selected from each of the selected communities for interview and a structured interviewer-administered questionnaire was administered to the head of each selected household or their spouse or adult child in their absence. This was preceded by a pre-test of the questionnaires. Results from the pre-tests were used to modify the final questionnaire. The questionnaire was divided into six sections. Section A elicited information on enumerators, communities and respondents. Section B included questions on general household information, while Section C elicited health-related information. Sections D and E elicited information on asset ownership and socio-psychological determinants of WTP for ITNs respectively, while section F presented the WTP questions and scenario.

Recruitment of Study Participants

Community heads in each selected community were first informed about the study. Thereafter, they were requested to make the necessary announcements concerning the study. Selected households within each community were visited to inform them of their selection and to obtain their consent. Thereafter, they were requested to arrange convenient time(s) for answering the questionnaires. Trained enumerators were employed for data collection.

Data

Table 1 below provides a description of variables used in the study.

Table 1: Description of Variables Used in Analysis

Variable	Description	Mean/Proportion	Sign
WTP	Amount (Naira) household is willing to pay for an ITN	All: NGN424.04(\$2.79); Respondents with positive amount: NGN544.63(\$3.58)	
WTPGRP	Group of respondents household belongs to; Zero WTP amount=0, Positive WTP amount=1	(0): 22.14%; (1): 77.86%	+

BID	Initial bid amount	NGN501.69 (\$3.30)	+
SEX	Respondent's gender; Male=0, Female=1	(0): 44.4%; (1): 55.6%	- (+)
AGE	Respondent's age in years	50 years	-
HHSIZE	Household size	5	+
PSNSTATUS	Respondent's status in household; Household head=1; Spouse to household head=2; Child to household head=3; Other=4	(1): 62%; (2): 28.6%; (3): 9%; (4): 0.4%	-
KNOMAL	Whether respondent had knowledge of malaria before interview; Yes=0, No=1	(0): 99%; (1): 1%	-
UFPREG	Whether respondent knew that under-five children and pregnant women were more vulnerable to malaria attack prior to interview; Yes=0, No=1	(0) : 45.7%; (1): 53.9%	-
KNONET	If respondent had knowledge of nets before interview; Yes=0, No=1	(0): 87.7%; (1): 12.1%	-
OWNNET	If household owns any net; Yes=0, No=1	(0): 35%; (1): 65%	-
KNOITN	If respondent had knowledge of ITNs before interview; Yes=0, No=1	(0): 54.1% ; (1): 45.1%	-
OWNITN	If household owns at least one ITN; Yes=0, No=1	(0): 19.1%; (1): 80.9%	-
USEITN	If anybody in the household (which owns at least an ITN) slept under it the previous night; Yes=0, No=1	(0) 66.7% ; (1) 33.3%	-
ITNMKT	Whether respondent knows	(0): 36.7%; (1): 63.3%	-

	where to buy an ITN; Yes=0, No=1	
TOILET	Whether household owns any toilet facility; Yes=0, No=1	(0): 38.2%; (1): 61.8% -
EDUCATION	Years of education attained by respondent	6 years +
INCOMEGRP	Quintiles of household monthly income (Naira)	+
FOODEXP	Household weekly food expenditure (Naira)	NGN1052.19 (\$6.92) + (-)
ATB	Attitude toward behaviour	+
SN	Social norm	+
PBC	Perceived behavioural control	+
MALPREV	Whether respondent had received information on malaria prevention in the last 12 months; Yes =0, No =1	(0): 63.53%; (1): 36.47% -
U5	Whether household has at least 1 under-five child; No=0, Yes=1	(0): 60.9%; (1): 39.1% -

Mean WTP for the entire sample was NGN424.04 (\$2.79), while the average value for the sub-sample of those who indicated interest in the commodity was NGN544.63 (\$3.58). About 78% of respondents were willing to pay for the commodity, while 22% were not willing to pay anything. Among these zero bidders, 14.9% indicated that they could not afford anything for an ITN, 12.8% said that it was not useful to their households, while 72.3% were of the view that the government should provide it free of charge. Men and women made up 44.4% and 55.65% of the sample respectively, while the average age of the sample was 50 years. Consistent with the 2006 census data, the average household size in the sample was 5, while ownership of any toilet facility was low: 38.2%. Due to the prevalence of malaria in the area, virtually every respondent was aware of malaria as a disease, but only 45.7% of respondents knew prior to the interview that under-five children and pregnant women were more susceptible to the disease. Though general knowledge of mosquito nets was high (88%), only 54.1% of the sample had knowledge of ITNs, while only 19.1% of households owned at least

one. However, among those that owned ITNs, 66.7% of households had at least a household member who slept under it the previous night. Some of the reasons given by those who did not use the nets included “ ‘net smells bad’, ‘chemical is dangerous’ and ‘it can kill children’ ”. Since majority of respondents (90.6%) had no formal employment, household monthly income for respondents in the informal sector was estimated from a process of accounting for household weekly economic activities (proceeds from petty trading, farm activities, etc), valuing such at their current market prices and converting same into monthly figures. The average *monthly* household income was about \$60.54. Also, household *weekly* expenditure on food items was about NGN1052.19 (\$6.92), implying that food expenditure accounted for more than half of household income. Apart from pervasive poverty, another important reason for the low level of ITN ownership may be lack of knowledge of selling points, as only 36.7% of households knew where the nets were being sold. Finally, about 63% of households admitted to having received information on malaria prevention in the past 12 months, while 39% of households had at least one under-five child.

Table 2: Distribution of WTP Responses

Category	Number of Observations	Percentage
Willing to Pay (valid figures)	275	66.4
Not willing to pay	91	22.0
Invalid WTP Responses	45	10.9
Refusal	3	0.7
Total	414	100.0

Table 2 shows the distribution of WTP responses. About 66% of the sample indicated valid WTP for the nets, 22% were not willing to pay, while 10.9% of WTP responses were deemed invalid owing to their abnormally high bid amount relative to respondents’ income. Three respondents declined answering the WTP questions.

Empirical Analysis

Sample selection tests were carried out using the Heckman two-step procedure (full information maximum likelihood models did not achieve convergence). Given the absence of sample selection bias (due to the non-significance of the inverse Mills ratio), OLS regression technique was employed (sample selection results are available on request). Also, tests of

differences of sample means were carried out. For the OLS specification, a sequential modelling process was adopted. This involved the following steps:

- (a) Specification of the socio-economic model (ECOMOD).
- (b) Specification of the socio-psychological model (PSYMOD).
- (c) Integration of both models (INTMOD).

The model specifications were as follows:

ECOMOD:

$$\text{LNWTP}_i = \beta_0 + \beta_1 \text{LBID} + \beta_2 \text{KNOITN} + \beta_3 \text{HHSIZE} + \beta_4 \text{U5} + \beta_5 \text{MALPREV} + \beta_6 \text{i.INCOMEGRP} + \beta_7 \text{SEX} + \beta_8 \text{AGE}^{1/2} + \beta_9 \text{OWNITN} + \beta_{10} \text{FOODEXP} + \mu_i$$

PSYMOD:

$$\text{LNWTP}_i = \alpha_0 + \alpha_1 \text{KNOITN} + \alpha_2 \text{ATB} + \alpha_3 \text{SN} + \alpha_4 \text{PBC} + \epsilon_i$$

INTMOD:

$$\text{LNWTP}_i = \theta_0 + \theta_1 \text{LBID} + \theta_2 \text{KNOITN} + \theta_3 \text{HHSIZE} + \theta_4 \text{U5} + \theta_5 \text{MALPREV} + \theta_6 \text{i.INCOMEGRP} + \theta_7 \text{SEX} + \theta_8 \text{AGE}^{1/2} + \theta_9 \text{OWNITN} + \theta_{10} \text{FOODEXP} + \theta_{11} \text{ATB} + \theta_{12} \text{SN} + \theta_{13} \text{PBC} + \epsilon_i$$

where β_i , α_i , and ϵ_i are parameters to be estimated.

The above specifications suggest that based on theory, prior empirical evidence and characteristics of the study population, socio-economic factors that determine WTP include household income, household weekly expenditure on food and whether the household has received information on malaria prevention (malaria education) in the past 12 months (MALPREV). On the other hand, socio-psychological determinants include ATB, SN and PBC. The incorporation of KNOITN in both models was based on the need to test the rationality assumption common to both models (Urama et al., 2006) in the sense that respondents who had prior knowledge of ITNs were more likely to pay higher amounts for the nets. A Cronbach's alpha test of statistical reliability on these three scales (ATB, SN, PBC) showed that they were internally consistent (standardized alpha coefficient of 0.79). In order to test if the integration of both models provided more robust results, the models were integrated.

2. Results and Discussion

Tests of differences in means showed that there was no significant difference between mean WTP of males and females. However, those who knew about ITNs before the interview were significantly richer than those who did not know ($p < 0.01$). Also, they were willing to pay more for an ITN ($p < 0.01$). However, those willing to pay were not significantly richer than those not willing ($p < 0.10$). Furthermore, respondents willing to pay for ITNs had more education than those not willing to pay ($p < 0.10$). In a similar vein, households willing to pay had more members ($p < 0.10$).

Table 3: OLS Results

Variable	ECOMOD	PSYMOD	INTMOD
CONSTANT	4.385966 (0.383118)***	5.795304 (0.13559)***	4.442175 (0.3400834)***
LBID	0.3532797 (0.046241)***		0.1971504 (0.0413612)***
KNOITN	-0.0317149 (0.0874058)	-0.3830796 (0.0842598)***	-0.0060275 (0.0779853)
HHSIZE	0.0190006 (0.0165085)		0.0333964 (0.0143783)**
U5	-0.0736165 (0.0728783)		-0.0811257 (0.0693592)
MALPREV	-0.2046222 (0.0764101)***		-0.0148576 (0.075941)
INCOMEGRP(2)	0.5995776 (0.1068626)***		0.4415663 (0.0827842)***
INCOMEGRP(3)	0.6209964 (0.1097796)***		0.5870777 (0.1004635)***
INCOMEGRP(4)	1.003447 (0.1119483)***		1.041601 (0.1064778)***
INCOMEGRP(5)	0.989682 (0.1331183)***		1.138351 (0.1215941)***
SEX	-0.0287027		-0.0332242

	(0.0710495)		(0.0718398)
AGE^{1/2}	-0.131074 (0.0358746)***		-0.0993274 (0.0296755)***
OWNITN	-0.1521363 (0.08378)*		-0.1403738 (0.0845222)*
FOODEXP	-0.000043 (0.0000455)		-0.0000831 (0.0000331)**
ATB		-0.0053635 (0.0027429)*	0.0009081 (0.002137)
SN		0.0025406 (0.0020364)	0.0021529 (0.0015314)
PBC		0.0183807 (0.0047304)***	0.0086229 (0.0036366)**
Adjusted R²	0.49	0.21	0.56

*, **, *** significant at 10%, 5% and 1% levels of significance respectively

For the economic model (ECOMOD), having received enlightenment on malaria prevention in the past twelve months, income, age and ITN ownership significantly influenced WTP. Virtually all the estimates conformed to expectations, as respondents who had malaria enlightenment and those who owned at least an ITN were willing to pay more. In particular, the sign of MALPREV was consistent with Holmes & Kramer (1995). Furthermore, males were willing to pay more. Also, younger respondents were willing to pay more. When viewed in the light of Grossman (1972) and Kenkel (1994) life cycle effect, this conformed to expectations as older respondents expect less payoff from any investment in health when compared to young respondents; thus, they are willing to pay less. In addition, respondents in higher income quintiles were willing to pay more than those in the lowest quintile. Even though prior knowledge of ITNs, household size and gender were not statistically significant even at the 10% level of significance, they conformed to expectations. As males are usually more financially well-off than women in the study area, it is not surprising that they were willing to pay more. The coefficient of expenditure on food items suggests that an increase in household food expenditure resulted in a lower WTP amount. This is not surprising given the substantial amount such households spent on food relative to total income (as noted above).

Results of the socio-psychological model suggest that prior knowledge of ITNs, ATB and PBC are statistically significant. All coefficients conformed to a priori expectations except that of ATB. The positive sign and significance of PBC imply that respondents who perceived themselves as having the necessary resources, innate ability, etc to pay for an ITN were willing to pay relatively high amounts, while the converse holds for those who felt that they lacked requisite resources to do so. The sign for ATB did not conform to a priori expectations. This is because a more favourable evaluation of the effectiveness of ITNs at curbing malaria should result in higher WTP. Furthermore, the coefficient of SN was consistent with theory as the more “significant others” want the respondent to purchase the nets, the more she would be willing to pay. In addition, the coefficient size of ATB and SN were relatively low. Apart from replicating most of the above results, the integrated model (INTMOD) shows that HHSIZE and FOODEXP were statistically significant. However, MALPREV and ATB were no longer significant, while ATB had the right sign.

Also, given the statistical significance of the coefficient of log of the initial bid amount (LBID), the above models indicate the presence of starting point bias which is a response bias induced by the initial bid amount presented to a respondent. Unfortunately, there is no agreed method of dealing with this bias (Mitchell & Carson, 1989) and as a result, no measure was taken to compensate for it.

In terms of magnitudes of the integrated model, an additional household member caused a 3.3% increase in average WTP while those in the highest income quintile were willing to pay over 100% more than those in the lowest income quintile. Respondents who owned at least one ITN prior to the survey were willing to pay about 14% more for an ITN, while a one point increase in perception of behavioural control led to about 0.9% increase in WTP, *ceteris paribus*. The average WTP of males was about 3.3% higher than that of females, while recent malaria enlightenment led to approximately a 1.5% increase in WTP on the average. Finally, respondents with prior knowledge of ITNs were willing to pay 0.6% more for an ITN than their counterparts.

In terms of coefficient size, integration resulted in lower values for most of the variables than what obtained in the single domain models. However, six variables recorded an increase in coefficient value and two of these (HHSIZE and FOODEXP) that were hitherto statistically insignificant even at the 10% level achieved significance at 5%. However, ATB, which was

marginally significant in PSYMOD became insignificant in the integrated model. Also, TPB only achieved significance at 10% in INTMOD as against 5% in PSYMOD.

Various diagnostics showed that the integrated model was more robust than either of ECOMOD and PSYMOD. Though each single domain model was statistically significant ($p < 0.01$), the integrated model achieved greater explanatory power than the individual models even with degrees of freedom adjustments (highest Adjusted R^2). Though ECOMOD did not display omitted variable bias (OVB), a Wald test of joint significance indicated that the TPB variables (ATB, SN and PBC) jointly exerted a significant impact on WTP in INTMOD ($p < 0.01$). A significant finding was that PSYMOD displayed OVB while INTMOD was immune from such bias. Based on these results (especially the higher adjusted R^2 of INTMOD and the joint significance of the TPB variables), we are inclined to believe that the relatively higher coefficient values seen in the single domain models might be an indication of upward bias. But such a conclusion may seem tenuous especially with regard to ECOMOD as it did not suffer from OVB. However, it is clear that PSYMOD suffered from OVB.

Additionally, the standard errors reported in all equations were robust to heteroscedasticity and there was no problem of multicollinearity. Table 4 shows the variance inflation factors of the regressors in INTMOD.

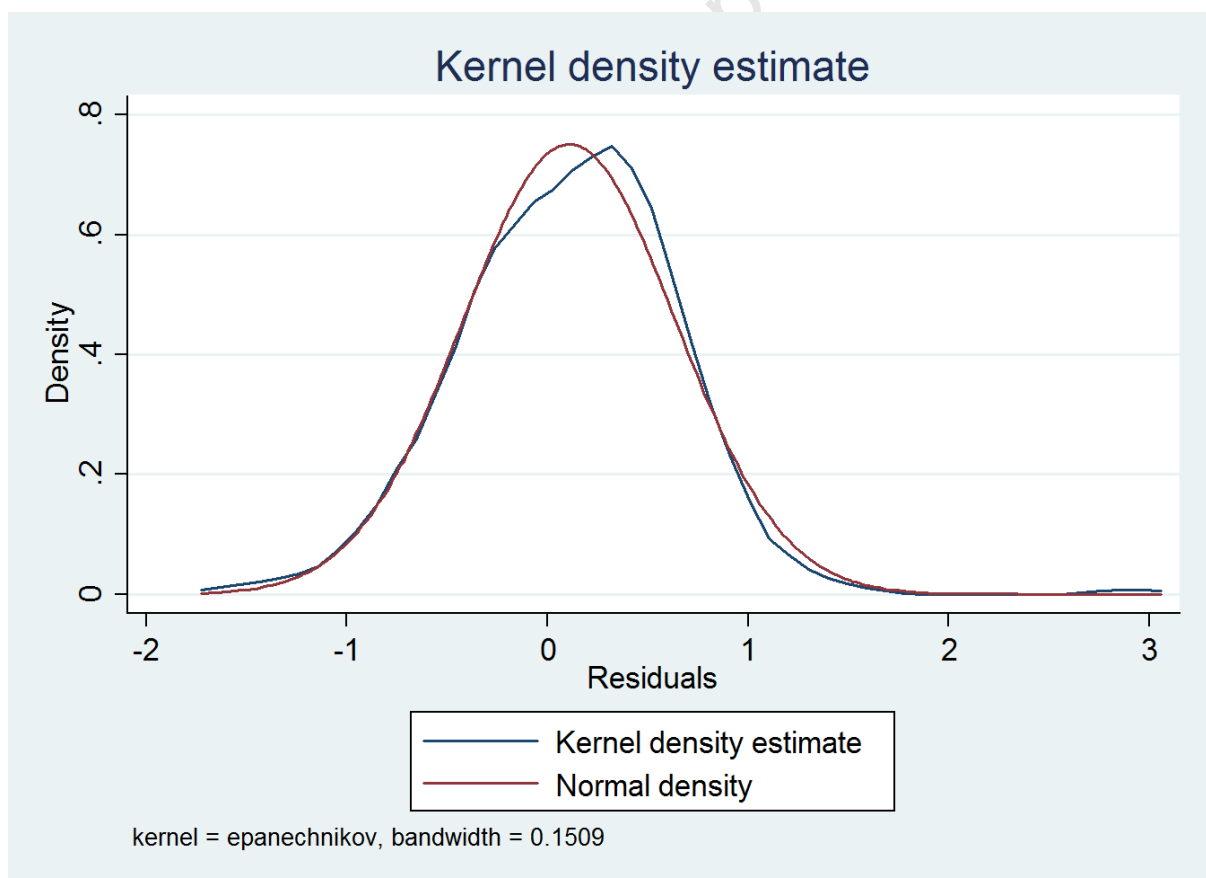
Table 4: Variance Inflation Factors (VIF) and Tolerance (TOL)

VARIABLE	VIF	1/VIF (TOL)
LBID	1.11	0.90
KNOITN	1.56	0.64
HHSIZE	1.35	0.74
U5	1.40	0.71
MALPREV	1.39	0.72
INCOMEGRP(2)	1.78	0.56
INCOMEGRP(3)	1.75	0.57
INCOMEGRP(4)	1.92	0.52
INCOMEGRP(5)	2.61	0.38
SEX	1.29	0.78
AGE ^{1/2}	1.24	0.81

OWNITN	1.42	0.70
FOODEXP	1.50	0.67
ATB	1.59	0.63
SN	2.29	0.44
PBC	2.21	0.45
MEAN VIF	1.65	

Also, a (Shapiro-Wilk) test of normality indicated that the residuals from both the single domain and integrated models were normally distributed. This finding assures us of the validity of our hypothesis tests since it shows that the p -values on which our tests depend are valid. A comparison of the kernel density of the residuals with the normal distribution confirmed this assertion. Fig. 2 shows such comparison for the integrated model.

Fig.2: Kernel Density of LNWTTP



Given that WTP was normally distributed, LNWTTP therefore followed a lognormal distribution with mean and median as follows (Strazzera et al., 2003a):

$$\text{Mean WTP} = \exp(x\beta + \sigma^2/2),$$

$$\text{Median WTP} = \exp(x\beta).$$

Table 5: Mean and Median WTP

	ECOMOD	PSYMOD	INTMOD
MEAN WTP (NGN)	545.53	536.96	463.09
MEAN CI (NGN)	516.86 – 574.19	517.97 – 555.94	438.25 – 487.93
MEDIAN WTP (NGN)	466.54	422.04	413.08
RAW DATA MEAN (NGN)	424.04		
RAW DATA: MEDIAN (NGN)	300		

Table 5 shows that mean and median WTP for the raw data were NGN424.04 (\$2.79) and NGN300.00 (\$1.97) respectively. Also, the respective values for the estimated sample were NGN545.43 (\$3.59) and NGN466.54 (\$3.07) - (ECOMOD), NGN536.96 (\$3.52) and NGN422.04 (\$2.78) - (PSYMOD), and NGN463.09 (\$3.05) and NGN413.08 (\$2.72) - (INTMOD). Given these results, it appears that single domain models over-estimated WTP in our population. Whether this conclusion would apply to other settings is an empirical issue that requires verification. However, given that the integrated model was relatively more robust, we are led to conclude that pricing decisions based on single domain models may overburden consumers and may not likely achieve the necessary patronage from them.

Given the fact that ITNs cost between \$3.50 and \$11 (<http://www.netmarkafrica.org/countries/nigeria/>), it becomes obvious that cost is a possible reason for low level of ownership since the net size upon which elicitation was based was the regular family size which costs about NGN1000.00 (\$6.58) (personal discussion with health worker). An obvious implication is that substantial government subsidies and/ or significant assistance from development partners are/ is needed in order to encourage rural households to purchase these nets.

3. Summary and Policy Recommendations

Given the United Nations (UN) Millennium Development Goal (MDG) of halting and reversing the incidence of malaria by 2015 and the fact that such a goal is being hampered by limited use of mosquito nets occasioned by poverty (<http://www.un.org/millenniumgoals/aids.shtml>), a study of not only the amount households are willing to pay, but the factors that influence their WTP decisions is not only timely, but essential. It is in this respect that this study, with its bias for a rural malaria-endemic community, becomes necessary. However, it must be noted that previous studies have been conducted on similar issues and locations (Onwujekwe et al., 2000; Onwujekwe et al., 2001; Onwujekwe, 2004). This study was principally necessitated by the need to ascertain if the integration of models based on economic theory and social psychology would produce optimal WTP estimates as well as to determine if malaria-specific enlightenment of rural dwellers has any impact on their WTP.

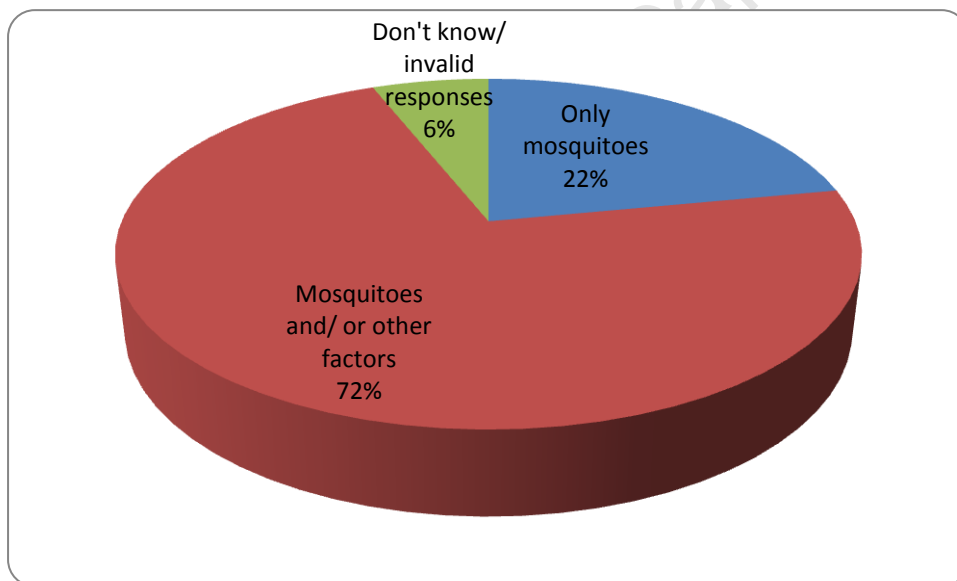
The study found that income significantly affects WTP. Those in the lowest income quintile exhibited the least WTP. Therefore, efforts to increase rural households' WTP for ITNs should include poverty reduction campaigns.

Furthermore, most CV studies make the implicit assumption that only socio-economic factors significantly drive WTP. However, this study has demonstrated that this is not necessarily true. Though two of the TPB variables were not individually statistically significant, the above analysis shows that all three TPB variables have a jointly significant impact on WTP in the integrated model. This implies that selective consideration of economic factors when implementing policies aimed at increasing rural dwellers' WTP and by extension, ownership of ITNs may not be appropriate. This policy stance concurs with the World Health Organization's emphasis on improving health care delivery through system-wide interventions (Hutton & Tanner, 2004). In other words, efforts to increase rural dwellers' WTP for ITNs must involve system-wide collaboration aimed at not only poverty alleviation. Recognition of the important role that agents of socialization such as family members, friends and the community can play in encouraging people to purchase these nets is desirable. Furthermore, the enhancement of rural dwellers' belief system with regard to their perception of innate ability to purchase the nets will likely encourage their purchase. This becomes even more compelling given the fact that the persistent significance of PBC across different models, coupled with its coefficient sign suggests that respondents with low feelings of innate

ability to buy the ITNs are willing to pay less amounts for them. Similar result obtains in a study of WTP for ITNs in rural Tanzania, where self-rated ability to pay is positively associated with maximum open-ended WTP (Mujinja, 2006).

Also in support of the earlier call for increased enlightenment, the fact that respondents with prior knowledge of ITNs have higher WTP suggests that educating rural dwellers on the benefits of ITNs is essential. Perhaps such education should start with an emphasis that mosquitoes are the *sole* vectors of the malaria parasite since ITNs directly serve to protect people from mosquito bites. This becomes imperative given that majority of respondents (72%) either believe that malaria is *exclusively* caused by factors other than mosquito bites (e.g. eating oily food, intense sunshine and strenuous farm work), or by a combination of these factors and mosquito bites. Such beliefs undoubtedly obviate the need for ITNs. Similar responses were also obtained in a NetMark study of the use of ITNs in Nigeria (<http://www.netmarkafrica.org/Research/quantitative/NigeriaQuanBaseSum.pdf>).

Fig 3: Distribution of Responses for Cause of Malaria



Furthermore, though malaria-specific enlightenment was not significant in the integrated model, it achieved statistical significance in the socio-economic model. It was also associated with the right sign across models. This suggests that such enlightenment campaigns about malaria prevention in general (not just limited to ITN ownership) would likely enhance WTP for the ITNs. However, we note that this might not be a strong policy instrument given our preference for INTMOD. This may be occasioned by the fact that when the TPB variables

(which incorporate the role played by informal educational organizations like the community and churches) are controlled for, recent malaria-specific enlightenment may no longer have a strong impact on WTP. Also, socio-economic variables still appear to be more important in ITN WTP determination as attested to by their relatively higher parameter values and number of significant variables.

Finally, efforts should be made to educate rural dwellers on the need to complement the government in the provision of these nets. The fact that about 16% of respondents said that they were not willing to pay since ITN provision was government responsibility is worrisome. Government should use appropriate channels such as radio, religious institutions, traditional rulers and women organizations to enlist rural people's support and encourage them to see themselves as partners with government and development partners in achieving the goal of malaria eradication.

4. Study Limitations and Further Research

As mentioned above, the current study was carried out in a rural area. As such, the conclusions and policy recommendations may not apply to urban dwellers. However, it is equally important to ascertain if integrated models of WTP apply in like manner to urban residents. This is consequent upon the fact that the UN MDG goal of using ITNs to accelerate malaria eradication may not be successful if the urban population is not covered. Therefore, future research should focus on whether socio-psychological variables play a significant role in determining the amount urban dwellers are willing to pay.

Finally, we note that the integration of socio-economic and socio-psychological WTP models may not provide a complete picture of the level of collaboration required for a holistic ITN intervention. Indeed, a study of WTP for biodiversity restoration has shown that ethical concerns with regard to respondents' beliefs about their inherent right to a given commodity/service significantly predict WTP (Urama et al., 2006). However, this study was not able to delve into this issue due to limited resources. It is our belief that research in this direction with respect to ITN WTP will likely yield useful insights.

Research Highlights

- ❖ Rural dwellers' ITN WTP is not only predicted by socio-economic variables; *feelings* of innate "ability to buy" influence it.
- ❖ Malaria-specific enlightenment enhances rural WTP for ITNs.

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PART D: POLICY BRIEF

Towards Improving Rural Dwellers' Willingness to Pay for Insecticide-treated Mosquito Nets: a Case of South-East Nigeria

Key Issues

- ❖ Malaria is endemic in Nigeria.
- ❖ About 72% of rural South-East Nigerian households still believe that malaria is not *solely* transmitted through mosquito bites. Some believe that eating oily food and too much exposure to sunshine are also causative factors.
- ❖ Insecticide-treated mosquito nets (ITNs) are effective in reducing malaria incidence.
- ❖ Most rural households (80.9% of sample) do not possess these nets.
- ❖ The issue of rural net ownership is a bigger malaria control imperative than its usage; 66.7% of ITN-owning households had someone who slept under it the previous night.
- ❖ The gap between the cost of the nets and the amount households are willing to pay for them is very wide; rural households are willing to pay NGN463.09 (\$3.05) for a family-size ITN that costs NGN1000 (\$6.58).
- ❖ Economic factors do not solely determine households' willingness to pay (WTP) for ITNs; people's innate beliefs and attitudes (i.e. socio-psychological factors) play a key role.
- ❖ Therefore, efforts to increase their WTP for these nets should include system-wide interventions.

Introduction

In Africa, a child dies of malaria every 45 seconds and the disease accounts for 20% of all childhood deaths. While the number of malaria cases in 2008 was about 243 million worldwide, the disease resulted in about 863000 deaths of which 89% were in the African region (World Health Organization 2009). Research has shown that ITNs are a cost effective means of controlling the disease and poverty hampers the United Nations (UN) Millennium Development Goal (MDG) of halting and reversing malaria incidence by 2015 (i.e. MDG 6C). This problem is more worrisome in the rural areas given the relatively high poverty rates there.

In Nigeria, only 6% of under-five children sleep under ITNs (World Health Organization 2009) while each ITN costs between \$3.50 and \$11 (<http://www.netmarkafrica.org/Research/quantitative/NigeriaQuanBaseSum.pdf>). This is obviously a heavy economic burden given that over 70% of Nigerians are classified as poor (<http://www.ruralpovertyportal.org/web/guest/country/home/tags/nigeria>). It is in this context that ascertaining the amount rural households are willing to pay for an ITN becomes timely.

Socio-psychological factors on the other hand, are hypothesized to play a vital role in determining household WTP for these nets. Broadly, people's attitudes and belief system determine whether they are willing to pay for different services/ goods or not (Ajzen, Driver 1992). However, evidence is largely lacking in this respect, especially with respect to ITN WTP behaviour in Nigeria. Therefore, it is important to consider not only single domain models of ITN WTP (in this case, behavioural models that exclusively focus on socio-economics or social psychology), but their integration in order to fashion out more holistic ITN interventions. Furthermore, though formal education has been found to influence WTP, the role of disease-specific enlightenment has not been given much attention. Based on these gaps, this policy brief draws on evidence from a recent study which investigated the determinants of WTP for ITNs in rural South-East Nigeria as well as similar studies conducted in South-East Nigeria.

Method

Regression analysis and tests of differences in means were employed on cross sectional data obtained via structured interviewer-administered questionnaires administered to 414 households in 7 rural communities in Nsukka Local Government Area (L.G.A.) of Enugu

State. The regression analysis was conducted using single domain models and an integrated model (i.e. a combination of both models).

Key Findings

(a) Socio-economic domain: Socio-economic factors play a key role in determining WTP for ITNs.

The study found that household income exerts a positive influence on rural household WTP for ITNs. Respondents in higher income quintiles were willing to pay more for an ITN than those in the poorest quintile. Similar results have been found by Onwujekwe et al (2005), whereby socio-economic status is positively related to respondents' WTP for ITNs. Also, the mean income of respondents who had knowledge of ITNs before the interview was greater than that of those without such knowledge. These results which show that poor households were willing to pay relatively little for an ITN support the UN's assertion that poverty significantly hampers the use of ITNs to eradicate malaria (<http://www.un.org/millenniumgoals/aids.shtml>). Also, WTP was negatively affected by household weekly food expenditure but positively influenced by household size.

(b) Socio-psychological domain: Attitudinal beliefs, social networks and feelings of innate ability jointly determine WTP.

WTP was not only determined by economic factors; psychological factors like people's attitudinal beliefs toward ITNs, social network of friends, family and colleagues, as well as their innate belief in their ability to purchase the nets jointly influenced their WTP decisions. In particular, the study showed that respondents with low belief profile were likely to pay lower amounts for an ITN. This implies that among a group of respondents on a similar socio-economic status, those who perceived themselves able to pay more for the nets indicated greater WTP. Furthermore, those with more favourable attitude toward paying for an ITN exhibited greater WTP for it.

(c) Integrated domain: Interventions that integrate economic and psychological aspects of human behaviour predict ITN WTP better.

Much as single domain WTP models significantly predicted ITN WTP for rural dwellers, the integration of both models explained WTP better.

(d) Enlightenment on malaria prevention increases rural dwellers' WTP for ITNs.

The study showed that having received information on malaria prevention in the past twelve months significantly predicted WTP in a positive manner. Thus, it was not just formal education (as shown in many previous studies) that influenced WTP; disease-specific enlightenment played a significant role.

(e) Many respondents do not believe that malaria is *solely* transmitted through mosquito bites.

The study showed that only 22% of respondents knew before the interview that mosquito bite was the sole mode of transmission of the disease. About 72% of respondents believed that eating oily food and too much exposure to sunshine were also causative factors.

Increasing Rural Dwellers' Ownership of ITNs: Different Action Policy Options

The World Health Organization (WHO) working definition for ITN universal coverage recommends targeting all persons at risk with long lasting insecticide-treated mosquito nets (LLINs), i.e. ITNs. Therefore, it proposes that one ITN should be distributed for every two individuals (World Health Organization 2010). In line with this target, Nigeria requires over 70 million ITNs given the 2006 population figures. With the foregoing in mind, possible policy actions that might be pursued, including their cost implications include:

- (a) **Free distribution:** Some authors have advocated free distribution of ITNs (Guyatt, Ochola & Snow 2002). However, given that one family-sized net costs about NGN1000 ((\$6.41), this would require over NGN70 billion (\$448.72 million). This is significantly in excess of the NGN67.28 billion capital allocation to the health sector in the 2010 budget (Federal Ministry of Finance 2010) and is likely infeasible. Though it remains incontrovertible that some households possess ITNs in Nigeria as a NetMark study indicates that 19 million ITNs were sold nationwide between 2002 and 2009 (<http://www.netmarkafrica.org/countries/nigeria/>), this study has shown that most rural South-Eastern households do not own any ITN. This trend is not likely to be different for other regions of the country. Given the above cost implications, it is

apparent that free ITN distribution to the rural population may not be feasible in the near future given a rural population of almost 80 million²⁰ as at 2009 .

(b) **Combination of free distribution to vulnerable groups and commercial sales at current rates to remaining rural population:** Given the enormous cost implications of free ITN distribution and that poor households are most unlikely to purchase commercially-delivered nets, a possible alternative may be free net distribution to poor and vulnerable groups and commercial net delivery to the remainder of the population in rural areas. This would undoubtedly reduce the resource implications required to achieve full rural ITN coverage, thereby freeing scarce resources for other health and non-health interventions. However, the successful implementation of such a policy remains doubtful given pervasive rural poverty as over 70% of the population are classified as poor . As noted above, the average rural household is willing to pay less than half the price of an ITN. Thus, this policy will likely result in poor ITN ownership by those not covered by the free distribution programme, leading to a possible re-infection of those protected under the policy. This will obviously erode any initial gains achieved through such selective coverage.

(c) **Combination of free distribution to vulnerable groups and *substantial subsidies* to remaining rural population:** A possible line of action may involve the combination of free distribution of the nets to poor and vulnerable groups (e.g. pregnant women and under-five children) and granting of substantial subsidies to the rest of the rural population. This, in our opinion represents a viable policy if full rural ITN coverage is to be achieved in the near future. Substantial subsidies are necessary given the amount households are willing to pay. Such a policy, which protects the most vulnerable (who may not be able to pay any positive amount no matter how small) and the less vulnerable (who would likely be willing to pay only a fraction of the current price) will likely accelerate full rural ITN coverage, thus guarding against re-infection identified as a potential consequence of the continued sale of these nets to any group at the commercial rates. As shown in the study, statistics on ITN usage in rural South-East Nigeria is not dismal (as 66.7% of ITN-owning households used them the previous night); ownership remains a source of grave concern (as 80.9% of households do not own any ITN).

²⁰ Though accurate statistics on the size of rural South-East Nigeria may not be readily available, the national figures indicate that they are substantial.

Policy Recommendations in line with Action Policy C: combination of free distribution to vulnerable groups and substantial subsidies to remaining rural population

The achievement of full rural ITN coverage in the near future will undoubtedly be expedited if rural dwellers show greater WTP for the nets. Thus, in line with the above policy option, we make the following recommendations:

(1) Education on malaria prevention and ITN effectiveness.

Periodic rural malaria enlightenment campaigns and workshops on the effectiveness of ITNs in malaria prevention should be carried out due to their positive effect on the amount people are willing to pay for a net. Therefore, resources should be allocated to developing and maintaining sustainable mass communication channels such as radio, religious institutions, schools and community health workers since these media and professionals are readily available and familiar to rural dwellers and play significant roles in their existence. The positive impact of familiar agents in enhancing health-seeking behaviour has been demonstrated among sex workers in South Africa (Campbell, Mzaidume 2001). A key message that should be communicated to the target audience is that malaria is *solely* transmitted via mosquito bites as this will likely encourage them to purchase and use the nets.

(2) Poverty alleviation

Given the positive role income plays in determining WTP, poverty alleviation efforts will likely increase the WTP of rural dwellers.

(3) Mental empowerment

Given that an individual's innate belief in her ability to pay (more) for ITNs exerts a positive and significant impact on WTP, efforts to increase rural dwellers' WTP should incorporate interventions that enhance their feelings of ability to purchase the nets. Given this finding, it is important to understand that poverty alleviation programmes may not exclusively result in substantial WTP enhancement. Therefore, it is important to adopt system-wide interventions that also recognize the role of psychologists in this regard.

Conclusion

In conclusion, this brief has illustrated that the average rural dweller's WTP for a family-size ITN is far less than its commercial price. Furthermore, it has shown that interventions aimed at its enhancement must involve system-wide approaches that cut across the fields of public health, economics and social psychology. Consequently, there is need to build synergy between development partners, ministries of health, education, women affairs and youth development, National Malaria Control Programme, the National Orientation Agency and various Local Government Health Authorities in order to accelerate the achievement of MDG 6 through more favourable ITN ownership.

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PART E: APPENDICES

Appendix 1: Note to Enumerators

Note to Enumerators

Malaria is a debilitating disease which affects majority of people in South-East Nigeria. Incidences of malaria are usually associated with loss of productivity, among other things. Malaria is caused by a parasite which is transmitted from one person to another via the bite of the female anopheles mosquito. Studies have shown that pregnant women and children under the age of five years are most at risk of the illness. Some of the symptoms include fever, tiredness, nausea, joint pain, excessive sleepiness, loss of appetite and headache. Furthermore, research has shown that insecticide-treated mosquito nets (ITNs) are an effective means of malaria control. This is because they not only kill mosquitoes, but prevent them from biting people who sleep under such treated nets. In line with the foregoing, it is the intention of this exercise to elicit households' willingness to pay (WTP) for family-size ITN(s).

The questionnaire would be divided into six sections. The different sections would be used to elicit general information, general household information, household health information, details of household assets, the socio-psychological factors that influence WTP, and the WTP scenario and questions. The format to be used for the WTP elicitation is the "Dichotomous Choice (DC) Method with debriefing follow-up questions". Therefore, you would be required to randomly select a given price from a list of prices for each respondent. For those who indicate that they are not willing to pay anything, you would then ask the reason(s) for such decision.

Please kindly note that you need to secure respondents' informed consent before obtaining any information from them (see Informed Consent Form).

Appendix 2: Informed Consent Form

INFORMED CONSENT FORM

We are embarking on a study aimed at estimating household willingness to pay (WTP) for insecticide-treated mosquito nets (ITNs) in rural South-East Nigeria. Consequently, we want to elicit information on various aspects of your household that we consider important for such estimation. This project is part of the requirements for the award of a Master of Commerce (M.Com) degree of the University of Cape Town, South Africa.

The study becomes important given the debilitating effects of malaria. Malaria has a high prevalence rate in Nigeria in general and South-East Nigeria in particular. It accounts for 40- 60% of all outpatient hospital/ clinic visits in Nigeria. It is caused by a parasite which is transmitted from one person to another by the female anopheles mosquito when it bites people. ITNs have been found to be effective in killing mosquitoes, thus protecting people from malaria attacks. However, a lot of resources is required for the provision of these nets to everyone. Thus the government and development partners may not be able to fully bear the burden of their provision. As a result, households are required to purchase these nets in some instances. Therefore we would want you to give us information on the amount of money your household would be willing to pay for a family-size ITN. This is hoped to inform government policy in terms of setting the price for such nets. We assure you that any information you provide will be treated with utmost confidentiality as your name will not be demanded (unless you indicate interest in the findings of the study). Furthermore, you may decide to participate or not with no adverse consequence resulting from such decision. If you participate, you may withdraw at any stage of the process should you decide, without any problem.

The procedure to be adopted is the elicitation of questions through an interviewer-administered questionnaire, while the estimated number of participants is four hundred (400). The procedure is expected to take few minutes of your time and, as mentioned earlier, you will be requested to provide private information pertaining to your household. However, your participation will not attract any special benefit to your household.

Therefore, we would want to obtain your signature indicating your free consent to participate in this study. This is part of measures required for the authentication of the findings of this research. Should you indicate interest in the eventual results of the study, appropriate arrangements would be made to communicate such to you. Thanks in anticipation of your cooperation.

Participant: I hereby certify that I fully understand the purpose of this study and freely decide to participate.

.....

Participant's signature

.....

Investigator's signature

If participant indicates interest in study outcome;

Name (for mailing purposes)

Address (P.O Box or P.M.B.)

.....

Email address.....

Appendix 3: Questionnaire

QUESTIONNAIRE FOR A STUDY OF WILLINGNESS TO PAY FOR INSECTICIDE-TREATED MOSQUITO NETS IN RURAL SOUTH-EAST NIGERIA

- ❖ *INSTRUCTIONS TO INTERVIEWERS ARE IN BOLD LOWER CASE CHARACTERS*
- ❖ *SOME QUESTIONS ARE ONLY ASKED DEPENDING ON PREVIOUS ANSWERS*
- ❖ *ENSURE THAT YOU ASK THE RELEVANT QUESTIONS ONLY*
- ❖ *WHERE APPROPRIATE, INDICATE RESPONSE WITH A TICK (✓)*
- ❖ *RESPONDENT MAY GIVE MULTIPLE ANSWERS TO SOME QUESTIONS*
- ❖ *">>" INDICATES "SKIP"*
- ❖ *"DK" INDICATES "DO NOT KNOW"*

--	--	--

Good morning/ afternoon/ evening. My name is and I am conducting a study aimed at determining people's willingness to pay (WTP) for insecticide treated mosquito nets (ITNs). This study is part of requirements for the award of a Masters degree in Economics. It is hoped that this research will enable us make useful recommendations to the government regarding what price people are willing to pay for a family-size ITN. This has become imperative owing to the high rate of malaria prevalence and the fact that ITNs have been found to significantly reduce the incidence of malaria. Hopefully the findings of the research will be communicated to you in due course. I will like to ask you some questions which will take some of your time. I assure you that whatever information you provide will be treated with confidentiality (notice that you are not required to provide your name). Of course you may choose to participate or not, and if you choose to participate, you may withdraw at any time you deem fit without incurring any adverse consequence. Thank you in anticipation of your cooperation.

A – GENERAL INFORMATION

Administer only to household heads or their spouses or the eldest member of household (provided s/he is up to 20 years) if either the household head or spouse is absent/incapacitated

A.1 Enumerator's Name:

--

A.2 Enumerator's ID: (e.g. 01, 02, 03, 04, 05)

--	--

A.3 Community Name:

--

A.4 Community ID: (e.g. 01, 02, 03, 04, 05)

--	--

A.5 Date:

Day	Month	Year

A.6 Respondent's Number: (e.g. 001, 002, 003,)

A.7 Do I have your permission to continue with the interview?

Yes	
No	

If Yes, proceed to Section B. If No, stop interview and offer your thanks.

B – GENERAL HOUSEHOLD INFORMATION

B.1 Respondent's Gender:

Male	
Female	

Employer	
Unemployed	
Self employed	
Employee	

B.2
Respondent's
age at last
birthday
.....
years.

B.3

Respondent's status in household

Household head	
Spouse to household head	
Child to household head	

Other (please specify).....

B.4 How many people (including you) live in this household?

--	--

B.5 How many under 5 children are in the household?

B.6 How many pregnant women are in the household?

B.7 What is the highest level of education of respondent?

No schooling	
Primary school (Primary 1 - 6)	
Secondary school (JSS1 – SS3)	
Ordinary National Diploma (OND) and its equivalents	
Higher National Diploma/ university degree	
Higher degrees (Masters, Doctorate, etc)	

Other (Please specify)

B.8 What is respondent's employment status in the past 2 weeks?

B.9 If employed, self employed or employer, what sector/ industry has respondent been engaged in during the past 2 weeks?

Agriculture/ Forestry	
Wholesale/ Retail trade	
Transport business	
Catering	
Manufacturing	
Public service	

Other (please specify)

B.10 Is household head first son of his family?

Yes	
No	

C. HEALTH INFORMATION

C.1 Did you have any knowledge of malaria before this interview?

Yes	
No	

C.2 If yes, what is the source of your information? **Respondent is allowed to name more than one source.**

School	
Mass media	
Church and/ or other social organizations	

Medical personnel	
Family, friends and relatives	

Others (please specify)

C.3 What do you think is the cause of malaria?

Only mosquitoes	
Mosquitoes and dirty environment	
DK	

Others (please specify)

C.4 How do you recognize a malaria episode?

Note: Respondent is allowed to name more than one option

Laboratory test	
Fever	
Bitterness of mouth	
Joint pain	

Others (please specify)

C.5 Has there been any malaria episode in the household in the past 2 weeks?

Yes	
No	
DK	

C.6 Who was/ were affected?

Respondent can give more than one answer.

I	
Spouse	

Child/ children	
Sibling(s)	
Parent(s)	

Others (please specify)

C.7 What primary source of care do you usually seek during a malaria episode in the household?

Hospital	
Health centre/ clinic	
Traditional healers	
Spiritualists (e.g. prayer houses)	
Chemists or patent medicine dealers	

Others (please specify)

C.8 Has the household spent money in the past 2 weeks treating malaria?

Yes	
No	
DK	

C.9 If yes, how much? Give amount in Naira (#)

..... Naira

C.10 Before this interview, were you aware that pregnant women and under 5 children were the most vulnerable to malaria attack?

Yes	
No	

C.11 What is the average amount spent by the household on malaria treatment per month?

..... Naira	Cannot Remember	<input type="checkbox"/>
-------------	-----------------	--------------------------

DK	<input type="checkbox"/>
----	--------------------------

C.12 What is the approximate distance from your house to the nearest hospital/clinic? KM.

Other (Please specify)

C.13 Prior to this interview, did you know anything about mosquito nets in general?

C.18 Are there any disadvantages of sleeping under a net?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>
DK	<input type="checkbox"/>

If Yes, >> C.14. If No, >> C.20.

C.19 If "Yes", can you name some of them?

C.14 What is the source of your information?

Health personnel	<input type="checkbox"/>
Friends, relatives or neighbours	<input type="checkbox"/>
Church and/ or other social organizations	<input type="checkbox"/>

It is hot sleeping under a net	<input type="checkbox"/>
Inadequate air inside the net and possibility of children suffocating	<input type="checkbox"/>
Difficult/ inconvenient for children to get up at night	<input type="checkbox"/>

Others (please specify)

Others (please specify)

C.15 Does your household own any net?

C.20 Have you received information on malaria prevention in the last 12 months?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

C.16 If "Yes", what type of net?

If answer is "Yes", >> C.21. If answer is "No", >> C.22.

Type	Quantity
Treated	<input type="checkbox"/>
Untreated	<input type="checkbox"/>

C.21 If "Yes", from who?

Health personnel	<input type="checkbox"/>
Friends, relatives or neighbours	<input type="checkbox"/>
Church and/ or other social organizations	<input type="checkbox"/>

C.17 What is the principal reason for sleeping under a net?

Other (please specify)

Protection against mosquito bites	<input type="checkbox"/>
Prevention of malaria	<input type="checkbox"/>
Enhancing comfort while asleep	<input type="checkbox"/>

C.22 Before now, have you heard about insecticide treated mosquito nets (ITNs)?

Yes	
No	

If 'Yes', >> C.23; if 'No', >> D.1.

C.23 If yes, from who?

Health personnel	
Friends, relatives or neighbours	
Church and/ or other social organizations	

Others (please specify)

C 24 Do you own an ITN?

Yes	
No	

C.25 If "No", why?

Enumerator, >>C.28 .But if answer to C.24 was "Yes", >> C.26.

C.26Did you or any household member sleep under it last night?

Yes	
No	

C.27 If "No", why?

C.28 What advantages are associated with sleeping under ITNs?

Respondent can give more than one answer.

None	
Kills mosquitoes	
Works better than untreated nets	
DK	

Others (please specify)

C.29What are the associated disadvantages (if any)?

Smells bad	
Chemical is dangerous	
Can kill children	
Can kill foetus/ lead to miscarriage in pregnant women	
Treated nets can cause illness in general	
DK	

Others (please specify)

C.30 Do you know where to buy an ITN?

Yes	
No	

C.31 If yes, how far is the nearest place to you? KM.

D. ASSETS/ HOUSING/ CONSTRUCTION MATERIAL

D.1 What is the tenure status of the house?

Owner-occupier	
Tenant	

Other (please specify)

D.2 Of what material is house made of?

Brick walls with corrugated roofing sheets/asbestos	
Mud walls with corrugated roofing sheets/ asbestos	
Mud walls with thatch roof	
Wooden material	

Other (specify)

D.3 Does the household have a toilet facility?

Yes	
No	

D.4 If yes, what type?

Pit latrine	
Water closet	
Bucket	

Other (specify)

D.5 Does the household own any of the following?

Item	Yes	No
Cattle		
Goat/ sheep		
Pig		
Economic tree		

D.6 Does the household own any of the following?

Enumerator, record only if in working order.

Item	Yes	No
Vehicle		
Motorcycle		
Bicycle		
Bed/ mattress		
Sewing machine		
Modern stove		
Electric iron		
Commercial grinding machine		
Electric fan		

Refrigerator		
Compact disk/ DVD		
Wall clock		
Television		
Radio		
Upholstery seats		
Computer		

Others (please specify)

D.7 How many dependants is the household fully training in post secondary institutions?

D.8 Do you belong to any saving scheme?

Yes	
No	

D.9 If "Yes", how much do you contribute monthly? Naira

D.10 What is your monthly income? (*if unemployed, please account for economic activities*)Naira

D.11 How much does the household spend on food weekly? Naira.

E. SOCIO-PSYCHOLOGICAL FACTORS

I am now going to ask you a series of questions that are likely to affect your disposition towards ITNs in general. Firstly, I will ask you questions that have to do with your feelings on paying (more) for ITNs. Then, questions bordering on factors that directly affect your WTP decision-making will be asked and finally, I will elicit responses on your views on the extent to which you can make such WTP decisions. You are to give your answers on a 1- 5 scale as shown below. Note that strictly speaking, there are no right or wrong answers. What is required is your honest answer as the validity of the study's results principally depends on this.

SPECIFIC ATTITUDE

Enumerator, show card for each question.

b ₁	My buying (an) ITN(s) now will reduce the threat of malaria in my household Extremely unlikely:---1----:--2-----:---3- ---:---4----:----5---: extremely likely	
e ₁	Reducing the threat of malaria is Not important:---1-----:---2-----:---3-----:--- 4----:---5----: extremely important	
b ₂	Buying more ITNs now will increase my family's protection against malaria: Extremely likely:---1----:---2-----:---3--- :---4----:---5----: extremely unlikely	
e ₂	Increasing my family's protection against malaria is Not a good idea:---1-----:---2-----:---3---- :---4----:---5----: a wonderful idea	
b ₃	Buying ITN(s) now will reduce the number of mosquitoes in the community extremely unlikely:---1----:---2-----:---3- ---:---4----:---5----: extremely likely	
e ₃	Reduction of mosquitoes in the community is Not important:---1-----:---2-----:---3-----:--- 4----:---5----: extremely important	
b ₄	Paying more for ITN(s) now will teach people to appreciate the importance of good health Extremely unlikely:---1---:---2---:---3--- :---4---:---5---: extremely likely	
e ₄	Teaching people more about the importance of ITNs is an Extremely bad idea:---1---:---2---:---3--- :---4---:---5---: extremely good idea	

Subjective Norms

s ₁	My spouse ----- of my buying ITN(s) now. Does not approve:---1---:---2---:---3---:--	
----------------	---	--

	-4---:---5---: approves	
m ₁	How much do you want to do what your spouse wants you to do? Not at all:---1---:---2---:---3---:---4---:--- 5---: very much	
s ₂	My close relatives (siblings, uncles, aunts, parents, etc) think that I ----- buy (more) ITN(s) now. Should not:---1---:---2---:---3---:---4---:-- --5---: should	
m ₂	How much are you determined to do what your close relatives want you to do? Not at all: ---1---:---2---:---3---:---4---:-- -5---: very much	
s ₃	The villagers think that I ----- pay more for ITN(s) now. Should not: ---1---:---2---:---3---:---4--- :---5---: should	
m ₃	How much do you want to do what the villagers want you to do? Not at all: ---1---:---2---:---3---:---4---:-- -5---: very much	
s ₄	My church thinks that I ----- pay more for ITN(s) now Should not: ---1---:---2---:---3---:---4--- :---5---: should	
m ₄	How much do you want to do what your church wants you to do? Not at all: ---1---:---2---:---3---:---4---:-- -5---: very much	
s ₅	My work colleagues think that I ----- pay more for ITN(s) Should not: ---1---:---2---:---3---:---4--- :---5---: should	
m ₅	How much do you want to do what your work colleagues want you to do? Not at all: ---1---:---2---:---3---:---4---:--	

	-5---: very much	
s ₆	Generally my friends think that I ----- pay more for ITN(s) Should not: ---1---:---2---:---3---:---4--- :---5---: should	
m ₆	How much do you want to do what your friends want you to do? Not at all: ---1---:---2---:---3---:---4---:- --5---: very much	

Perceived Behavioural Control

c ₁	I can easily buy more ITNs now for my household Strongly disagree: ---1---:---2---:---3---:- --4---:---5---: strongly agree	
p ₁	How much control do you believe you have over buying more ITNs for your household? No control: ---1---:---2---:---3---:---4---:- --5---: absolute control	
c ₂	For me, paying more for an ITN now would be ---- Impossible: ---1---:---2---:---3---:---4--- :---5---: possible	
p ₂	How much control do you believe you have over the decision to purchase an ITN? No control: ---1---:---2---:---3---:---4---:- --5---: complete control	

F. WTP SCENARIO AND QUESTIONS

Scenario

Malaria is a debilitating disease which affects majority of people in South-East Nigeria. It is caused by a parasite which is transmitted from one person to another via the bite of the female anopheles mosquito. Studies have shown that pregnant women and children under the age of five

years are most at risk of the illness. Some of the symptoms include fever, tiredness, nausea, joint pains, excessive sleepiness, loss of appetite and headache. Furthermore, research has shown that insecticide-treated mosquito nets (ITNs) are an effective means of malaria control. This is because they kill mosquitoes, thus preventing them from biting people who sleep under such treated nets.

Consequent upon the importance of ITNs and their effectiveness, we will require you to tell us the amount of money you will be willing to pay for a family-size ITN so as to provide your family and yourself protection from mosquito bites and ultimately, malaria. Also note that treatment of a net with insecticides lasts for about six months on the average after which the net would be due for re-treatment at additional expense. **Please it is very important that you take into account your income level, current expenditures on other items (especially basic necessities) and the fact that you will have to re-arrange your expenditure/ saving pattern due to purchasing the ITN(s), before giving any WTP amount.** Please note that even though this is a hypothetical construct, you are expected to give the amount you would be actually prepared to pay had the ITN been presented to you. Also remember that your decision to vote for any price should not be influenced by the current market price of an ITN. You should also bear in mind that the payment vehicle to be used is cash. If you are confused regarding any aspect of the questions we are about asking you, feel free to ask for clarification. **Unless otherwise stated, the nets we would be considering are the family-size ones.**

Dichotomous Choice Method with Debriefing Follow-up Questions

Enumerator, ensure that respondent understands the above scenario. If not, re-explain.

F.1 Given the advantages associated with ITNs, would your household be willing to pay ----- Naira for the purchase of an ITN if it were offered to you today?

Prices (Naira amounts) to be used are: (100, 200, 300, 400, 500, 800, 1000, 1200). Enumerator, randomly select one price for each respondent.

Yes	
No	

F.2 What is the maximum amount you are willing to pay for a net? Naira.

>> **F.4 if positive WTP amount is given. Otherwise, >> F.3.**

F.3 (To be asked if no WTP amount is reported)

Why is your household not willing to pay anything for an ITN?

F.3.1	We cannot afford it	
F.3.2	ITN is not useful to my household	
F.3.3	The government should provide it free of charge	
F.3.4	I do not know	
F.3.5	I do not understand the question	
F.3.6	I do not like the payment vehicle	

Others (specify)

If response is F.3.1, F.3.3, F.3.4 or F.3.6, >> F.5. If response is F.3.5, re-explain F.1 and ask again. If response is F.3.2, stop interview.

F.4 Given the size of your household, the number of under 5 children and pregnant women therein as well as your household income and expenditure, how many ITNs are you willing to pay for?

F.5 How many do you think your household needs for adequate protection?

F.6 (Enumerator, ask only if answer to F.3 is F.3.6) What payment vehicle do you prefer?

.....

Thank you for your active cooperation.

University of Cape Town

Appendix 4: Ethics Approval Letter



UNIVERSITY OF CAPE TOWN

Health Sciences Faculty
Faculty of Health Sciences Research Ethics Committee
Room 1352-24 Grootte Schuur Hospital Old Main Building
Observatory 7925
Telephone (021) 406 6338 • Facsimile (021) 406 6411
e-mail: ethics@uct.ac.za

29 October 2010

HREC REF: 501/2010

Mr C Nwosu
Health Economics Unit
Public Health & Family Medicine
Schmiedl Building

Dear Mr Nwosu,

PROJECT TITLE: WILLINGNESS TO PAY FOR INSECTICIDE-TREATED MOSQUITO NETS IN RURAL SOUTH-EAST NIGERIA: AN INTEGRATED APPROACH

Thank you for submitting your study to the Health Science Faculty Research Ethics Committee for review.

It is a pleasure to inform you that the Ethics Committee has formally approved the above-mentioned study.

Approval is granted for one year till the 15th November 2011.

Please submit a progress form, using the standardized Annual Report Form (HS016), if the study continues beyond the approval period. Please submit a Standard Closure form (HS010) if the study is completed within the approval period.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the REC REF in all your correspondence.

Yours sincerely,

pp
PROFESSOR M BLOCKMAN
CHAIRPERSON, HSE HUMAN ETHICS

Federal Wide Assurance Number: FW A05001637
6A16622

Institutional Review Board (IRB) number U3180001938

This serves to confirm that the University of Cape Town Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA USA), International Convention on Harmonisation of Good Clinical Practice (ICH GCP), and Declaration of Helsinki guidelines.

The Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines ICH Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 312.56 and 312.61.

Signature

Appendix 5: Plagiarism Declaration Form

PLAGIARISM DECLARATION

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2. I have used the Harvard convention for citation and referencing. Each significant contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, cited and referenced.
3. This dissertation is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.
5. I acknowledge that copying someone else's work or part of it is wrong.

NAME: CHIJOKE OSINACHI NWOSU

STUDENT NUMBER: NWSCHI002

SIGNATURE:  _____

Appendix 6: Journal Instructions for Authors

SOCIAL SCIENCE & MEDICINE

AUTHOR INFORMATION PACK

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ISSN: 0277-9536

DESCRIPTION

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2) Peer-reviewed short reports of research findings on topical issues or published articles of between 2000 and 4000 words.

3) Submitted or invited commentaries and responses debating, and published alongside, selected articles.

4) Special Issues bringing together collections of papers on a particular theme, and usually guest edited.

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GUIDE FOR AUTHORS

INTRODUCTION

Click [here](#) for guidelines on Special Issues.

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- 3) Submitted or invited commentaries and responses debating, and published alongside, selected articles.
- 4) Special Issues bringing together collections of papers on a particular theme, and usually guest edited.

BEFORE YOU BEGIN

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Appendix 7: Derivation of Socio-psychological Variables

Measuring Behavioural Beliefs

ATB will be determined by a set of questions on belief strength and their respective evaluations such as:

Behavioural belief strength (b)

My buying (an) ITN(s) now will reduce the threat of malaria in my household

Extremely unlikely: ----1-----:----2-----:----3-----:----4-----:----5-----: extremely likely

Outcome evaluation (e)

Reducing the threat of malaria is

Not important: ----1-----:----2-----:----3-----:----4-----:----5-----: extremely important.

There will be similar questions covering the respondent's attitude toward ITNs and malaria in general. Thus,

$$\dots\dots\dots (1),$$

where r refers to the particular belief question/ evaluation; k is the number of belief questions, while i refers to the particular respondent. Here, belief strength and outcome evaluation are measured in a unipolar way with higher numbers representing higher subjective probabilities and more favourable evaluations respectively. A similar structure is adopted for the other questions.

Measuring Normative Beliefs

The logic for assessing normative beliefs is similar to that used in measuring behavioural beliefs; e.g.

Normative Belief Strength (s)

My spouse thinks that I

Should not: ----1-----:----2-----:----3-----:----4-----:----5-----: should

purchase ITN(s) now.

Motivation to Comply (m)

How much do you want to do what your spouse wants you to do now?

Not at all: ----1-----:----2-----:----3-----:----4-----:----5-----: very much

Similar questions are posed with regard to each accessible referent. By accessible referents, we mean those individuals and groups that are likely to (directly) influence a respondent's behaviour. Summing measures of normative belief strength and motivation to comply over all accessible referents gives a snap-shot of perceived social pressures for each individual (Ajzen 2002). Thus:

$$\dots\dots\dots (2)$$

f is the number of accessible referents, while j refers to the particular normative question/ evaluation.

Measuring Control Beliefs

These consist of a list of accessible control factors that may enhance or impede the respondent's WTP for an ITN. For instance;

Control Belief Strength (c)

I can easily afford to pay more for an ITN now

Strongly disagree: ----1----:----2-----:----3-----:----4-----:----5-----: strongly agree

Control Belief Power (p)

How much control do you think you have over the decision to pay more for an ITN?

No control: ----1-----:----2-----:----3-----:----4-----:----5-----: absolute control

The control belief power tells us the extent to which the control factor's presence has the power to impede or enhance behaviour. PBC is obtained thus;

$$\dots\dots\dots (3)$$

Eqn (3) is defined similar to equations (1) and (2), with g measuring the number of accessible control factors and l referring to a particular behavioural control question/ evaluation.

Endnotes

ⁱ152 Nigerian Naira (NGN) = US\$1.

ⁱⁱSocio-economic model (ECOMOD); Socio-psychological model (PSYMOD); Integrated model (INTMOD).

ⁱⁱⁱEmpirically, both models can contain a number of common variables prior to integration.