An estimation of the willingness to pay for community healthcare insurance scheme in rural Nigeria

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Summary

Health care financing in Nigeria for the rural poor is a major problem because of the impoverishing effect of the predominant out-of-pocket payment. Prepayment schemes are suggested as options of increasing access to health care services and these schemes have not received considerable attention in Nigeria. In this regard, a community health prepayment poverty alleviating scheme is proposed. Investigating the willingness of households to pay for such schemes using a variant of methodologies, the study shows that community members are willing to participate with a high level of confidence. Incorporating uncertainty in health care contingent valuation using random valuation shows that high level of optimism yields higher amounts. The most vulnerable groups with respect to health care financing in the rural population are identified as women, the old, less educated and the poor. The study provides policy prescriptions, which aim to target the most vulnerable within the community.

Keywords: Willingness to pay; contingent valuation; Stochastic Payment Card; Dichotomous choice; health care financing; uncertainty; commodities; Random valuation.

JEL classification: C35, C81, D60, D81, I10
1. Introduction

In Nigeria, about 70% of the population reside in the rural areas with over 65% of the overall population living below poverty line of about US$1/day and the bulk of the poor spend over 80% of their earnings on food (WHO, 2002). This is attributed to low level of literacy and high level of income inequalities as evidenced by a high Gini coefficient of income distribution (0.51). Similarly, about 60% of rural dwellers have access to health care, which is mainly of a poorer quality of care (ILO, 2001). Access to health care has been greatly reduced for the poor households due to their low purchasing power evidenced by their earnings and expenditure patterns. This is because of the nature of the predominant health care financing mechanism earlier identified. Hence, occurrence of illness which is often times stochastic requiring payment at the time of occurrence further restricts rural households’ access to health services and further impoverish these households hence denying the poor, access to basic care (OECD/WHO, 2003). This catastrophic\(^1\) nature of financing health care for the poor and often rural population has been a source of worry for the country and other low and middle-income countries (LMICs) of Africa. Advocates, therefore, have been in favour of developing alternative financing schemes to cater for the unexpected nature of health care expenditure which should cover the vulnerable\(^2\) within the society and where these alternative sources of financing have been instituted, they tend to favour the higher socioeconomic groups (Ogunbekun, 1996) and are often targeted at urban areas and cities where the burden of disease is low which reinforces the inverse care law (Hart, 1971). To get around this problem and safeguard the rural poor from the catastrophic nature of health financing, prepayment schemes and community based insurance schemes have been advocated (WHO, 2000; Ogunbekun, 1996; Dong et al., 2003a).

Available health statistics show that life expectancy of Nigerians dropped from 53.8 years (females) and 52.6 years (males) in 1991 to 46 and 45 years respectively in 2003. Also, infant mortality rate (IMR) rose from 87.2 per 1,000 live births in 1990 to 100 in 2003. Similarly, under-5 mortality rate (USMR) rose from 187 per 1,000 in 1998 to 198 in 2003 and about 57% of these under-5 deaths are associated with malnutrition (a consequence of poverty). Maternal mortality rate also stands high at 800 per 100,000 live births and these death rates have been attributed to diseases such as malaria and diarrhoea and also to shortages in skilled medical personnel\(^3\) of which the poor are mostly affected. The leading causes of child mortality include malaria (30%), diarrhoea (20%), and malnutrition accounts for 52% of under-5 deaths in Nigeria. HIV/AIDS prevalence as at 2003 is estimated as 6.1% of the population\(^4\). The

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\(^1\) Such payments are payments in excess of \(x\)% of the household income (see Ranson, 2002). This is any payment for health care in excess of say 10% of the household disposable income. This is because any payment in excess of the threshold will mean that households may not be able to spend enough on food, education and other human needs.

\(^2\) Usually identified as the poor (both urban and rural)

\(^3\) The percentage of births attended to by skilled personnel (35% in 2003).

\(^4\) Nigerian National Planning Commission.
disability-adjusted life expectancy (DALE) is estimated at 38.3 years and this puts Nigeria in 187th position in ranking by the World Health Organisation (WHO, 2002; Johnson, 2000).

The scenario of private health insurance (PrHI) in Nigeria as presented in Table 1 is worrisome for the poor. Of about 150 insurance companies operating in the country, less than ten (10) offered PrHI policies of which only four (4) explicitly have independent schemes while the others co-insure (Ogunbekun, 1996). Table 1 shows the profile of the major PrHI companies operating in Nigeria. Three of the four companies are located in Lagos while the other in Enugu which are commercial and capital cities of Nigeria.

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>No. Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial and general insurance company Ltd. (IGI)</td>
<td>Lagos, Lagos state</td>
<td>700</td>
</tr>
<tr>
<td>International standard insurers Ltd. (ISI)</td>
<td>Lagos, Lagos state</td>
<td>17,447</td>
</tr>
<tr>
<td>Newline insurance company Ltd. (NIC)</td>
<td>Lagos, Lagos state</td>
<td>Not available</td>
</tr>
<tr>
<td>Shelter insurance company Ltd. (SIC)</td>
<td>Enugu, Enugu state</td>
<td>7,500</td>
</tr>
<tr>
<td>Phoenix assurance of Nigeria Ltd. (PAN)</td>
<td>Not available</td>
<td>Not available</td>
</tr>
</tbody>
</table>


Being a private enterprise, most of the plans cover employees in the private companies and parastatals to lower administrative and sales costs hence the relative location of the PrHI plans within the urban as well as the highly commercial and industrial areas such as Lagos, Enugu, Port Harcourt and so on. (Ogunbekun, 1996). Most of these companies do not sell private plans to individuals and those that do sell to individuals are sold to the affluent which sometimes cover treatment abroad (Ogunbekun, 1996). The poor and often the rural dwellers therefore lack access and are excluded from these schemes in Nigeria hence the need to develop alternative financing mechanisms that will cater for the poor.

**Nature of Health Care Payments in Nigeria**

Varied sources of Health care financing are available in Nigeria like in most other similar countries of the world which include budgetary allocations from the government at all levels of the federalism structure (local government, state, and federal); loans and grants obtained from multilateral and bilateral agencies in the form of international aid; private sector contributions and out-of-pocket payment (WHO, 2002). Table 2 provides a summary of the shares of various financing mechanisms in Nigeria and the picture shows that private sector financing made up largely of out-of-pocket payments still remains large and dominant. Government funding on health has been on a decline. This has made health care financing a central issue and a major source of concern and has posed challenges to the government, academics, policy makers and health policy experts within the country (Ogunbekun, 1996).

With regard to relative dependence of Nigeria on donor funding especially in the health sector,

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5 The company collapsed in 1997 and they had to pull out of operation. This was the largest of private insurance companies operating in Nigeria prior to its collapse (ILO, 2001).

6 This was a new firm which joined the industry since 1997 (ILO, 2001).
there has been a decline in external resources on health as a percentage of total health expenditure (see Table 2).

Given the predominance of OOP payments, the nature and distribution of population between the urban and rural and the extent of poverty in Nigeria, further impoverishment of rural households is rife with continual OOP payments. This has been identified as the link between poverty and health and has long been acknowledged in literature (see Whitehead et al., 2001; OECD/WHO, 2003).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Total Health expenditure as a fraction of GDP</th>
<th>Government expenditure as a percentage of total health expenditure</th>
<th>Private sector expenditure on health as a % of total health expenditure</th>
<th>Private households' OOP* as a % of private sector health expenditure</th>
<th>Prepaid and risk-pooling plans as % of Private sector expenditure on health</th>
<th>General government expenditure on health per capita at exchange rate</th>
<th>General government health expenditure as a % of general government expenditure</th>
<th>External resources on health as a % of Total expenditure on health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>5.5</td>
<td>26.1</td>
<td>73.9</td>
<td>95.0</td>
<td>2.4</td>
<td>4</td>
<td>7.1</td>
<td>13.1</td>
</tr>
<tr>
<td>1999</td>
<td>5.4</td>
<td>29.1</td>
<td>70.9</td>
<td>94.8</td>
<td>3.4</td>
<td>5</td>
<td>5.4</td>
<td>13.8</td>
</tr>
<tr>
<td>2000</td>
<td>4.3</td>
<td>33.5</td>
<td>66.5</td>
<td>92.7</td>
<td>5.1</td>
<td>6</td>
<td>4.2</td>
<td>16.2</td>
</tr>
<tr>
<td>2001</td>
<td>5.3</td>
<td>31.4</td>
<td>68.6</td>
<td>91.4</td>
<td>6.5</td>
<td>6</td>
<td>3.2</td>
<td>5.6</td>
</tr>
<tr>
<td>2002</td>
<td>5.0</td>
<td>25.6</td>
<td>74.4</td>
<td>90.4</td>
<td>6.7</td>
<td>5</td>
<td>3.1</td>
<td>6.1</td>
</tr>
<tr>
<td>2003</td>
<td>5.0</td>
<td>25.5</td>
<td>74.5</td>
<td>91.2</td>
<td>6.7</td>
<td>6</td>
<td>3.2</td>
<td>5.3</td>
</tr>
</tbody>
</table>

* Out-of-pocket payment.

Objectives of the Study

The main aim of this research is to apply the contingent valuation methodology (CVM) to investigate on empirical grounds, the basis for community premiums of the proposed risk-sharing scheme aimed at poverty alleviation and to mitigate the catastrophic effect of health care payment in rural Nigeria.

Specific objectives of the study are:

1. To estimate the willingness of rural households to pay for a community prepayment scheme using the Dichotomous Choice Method (DCM) and the Stochastic Payment Card (SPC) design;
2. To determine the major factors that determine rural households’ willingness to pay for the proposed scheme;
3. To determine the possibility of use of payment vehicles other than cash as it relates to rural communities;
4. To compare the results from the two CVM formats for health policy and methodological reasons.

Justification and Policy Relevance of the Research

The Nigerian government recently re-launched the National Health Insurance Scheme (NHIS) in June 2005 that was first launched in October 1997 (Nwezeh, 2005) and it is yet to be fully implemented. The NHIS was born out of the general poor state of the nation’s health care services; the excessive dependence and pressure on government provided facilities; dwindling funding of health care in the face of rising costs and population; and poor integration of private health facilities in the nation’s health care delivery system (NHIS Protocol, 2003). The major objectives of the NHIS was among others, to ensure that every Nigerian has access...
to good health care services; protect families from the financial hardship of huge medical bills; limit the rise in the cost of health care services; ensure that health care cost are distributed equitably among different income groups; and ensure high standard of health care delivery services within the scheme (Laws of the Federation of Nigeria Decree 35, 1999). The benefits to be derived from the scheme include, outpatient services, prescribed drugs under the Essential Drugs List (EDL), diagnostic tests, maternity, antenatal and postnatal care, immunization and family planning among others (Laws of the Federation of Nigeria Decree 35, 1999).

To ensure the smooth takeoff of the scheme, it was further designed into ten distinct programmes to cater for different groups of people. Of interest in this research is the Rural Community Social Health Insurance Programme (RCSHIP) which is targeted at rural dwellers who are not in regular employment to increase their access to health care. The programme is designed to be run by community members elected by the community.

To fully derive the intended benefits of the scheme, quantitative data is needed for pricing the schemes. Often, these schemes are not assessed by desk officers quantitatively before commencement either as a result of lack of appropriate skills or the lack of knowledge of existing quantitative methodologies (Fonta and Ugwuozor, 2005). In this regards, it is important to know the amount rural households are willing to pay (WTP) for any such health insurance scheme on the basis of the contingent valuation method (CVM), and to know if there exist any difference between how much these rural households are WTP and the actual cost of treatment. This information helps the government, planners and policy makers to know if the introduction of such schemes justifies the intended objective and the form of subsidies and supplementary funding from the government and donor agencies to cover for the differences if any. Similarly, level of community trust, participation and confidence can be assessed since the scheme is to be instituted and managed by the rural communities.

Obtaining in monetary terms the amounts households are WTP for such insurance scheme which is aimed at mitigating the unexpected effect of health care payments and help alleviate poverty, will involve observation of how much individuals are willing to part with to restore their health state in event of deterioration since health is not directly tradable on the market like any other commodity. The research is hoped to provide empirical grounds in the application of CVM to studies in health care and the relative importance of the formats to be used and help broaden the literature in this area.

In terms of policy relevance, one of the major extensions is the inclusion of uncertainty in modelling individual’s behaviour in health care literature using the Stochastic Payment Card design to mimic decision making in a real world situation. Results obtained from this study will therefore inform policy in: Knowing the value rural households and the poor place on their health and health care needs; their willingness and readiness to participate in a community financing scheme which will form a basis for expansion of such schemes in the country;
Identifying the vulnerable groups and to determine what form of contributions mediums to apply; and identifying the volume of financial resources that will be available to such schemes (from a welfare estimation perspective) and to know if there exist any significant difference between these amounts and the actual cost of treatment, hence identify the nature and commitment of the government, donors and other financial contributors toward health care subsidy.

For the rest of the report, the next section introduces the theoretical framework and a review of the literature in the area of CVM in health care including uncertainty in contingent valuation. The methodology section follows immediately which introduces the methods used for data analyses and the data methodology. The section following this presents the results of the analyses including policy conclusions.

2. Theoretical Framework and Literature Review

Theoretical Framework

From the neo-classical theory of welfare economics point of view, which incorporates the preferences of individuals/households, where interest lies in obtaining monetary values for any changes in welfare (gain or loss) due to the availability of a specified public good, or in the case of health and health care, changes in the states of health led to the use of the willingness to pay (WTP) and the willingness to accept (WTA), which are often referred to as methods of contingent valuation (CVM) (Hanemann, 1991a; Johannesson, 1996; Bala et al., 1999; Smith et al., 1999c). Originally used in the theory of welfare economics to analyse price changes, Karl-Göran Mäler (1974) first showed that the concept could be employed to analyse quantity changes (see Hanemann, 1991a). Closely related to the theory of consumer demand, the maximum amount an individual is WTP gives the value of a health intervention aimed at improving the state of health of the individual (Donaldson et al., 1998; Bala et al., 1999). The amount individuals are WTP is assumed to be additive across individuals within a certain household and community. This implies that the maximum amount a household is WTP is the sum of the WTP amounts for each individual in the household. The same analogy holds for the community.

Let $i$ represent the individual in the $j$th household and $k$ represent the community of $j$ households then,

$$\hat{\lambda}_i WTP_i = WTP_j \quad \text{and} \quad \hat{\lambda}_j WTP_j = WTP_k \quad (1)$$

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7 This is defined, as the maximum amount an individual is willing to part with to have the scheme initiated. In this context, this may be referred to as Compensating Variation (CV). Smith et al. (1999c) favoured the use rather of this measure due to observed disparity in the WTA and WTP (WTA $>$ WTP) following the NOAA panel’s report.

8 This is the minimum amount an individual or household will be willing to accept to forgo the initiation of the scheme. This may also be interpreted as the Equivalent Variation (EV).

9 It is simply a survey-based device, which operates on the general assumption that one can put monetary valuation on certain classes of goods and services for which there is no market and therefore no price or compensation payment.
Assume individuals to be risk averse with respect to income in demanding health care, and employing the utility income mapping, also assuming that utility or well-being of an individual is dependent on income and health, the amount an individual will be WTP for an improvement in health or in this case, the amount to be paid into the prepayment scheme, will be the amount of income the individual will be willing to part with still leaving the individual on the same level of utility or well-being as before the payment.

The maximum amount individuals are WTP for the improvement in health state as shown in Figure 1, is defined as the gap between \( Y_0 \) and \( Y_1 \) measured as \( Y_0 - Y_1 \) where the curve \( U_0 \) denotes the original level of health status and \( U_1 \) denotes the improvement in health status. It can be immediately observed that the income level at an improved state of health is lower \( (Y_1 < Y_0) \) due to the payment, though the individual still maintains the same level of utility denoted by \( \bar{U} \) on an improved health state. If the individual had to pay an amount higher than the amount \( Y_0 - Y_1 \), then the loss in income will more than offset the increase in wellbeing as a result of the increase in health status (Bala et al., 1999; Johannesson, 1996). This implies that the amount an individual is WTP determines the level at which the individual values the health in relation to the income level and how serious the case of ill health may be. Since health care is not a good traded on the market as other commodities (Johannesson, 1996; Bala et al., 1999), one cannot obtain valuations of WTP directly hence the use of the contingent valuation methodology (CVM).

Consider a risk averse individual with utility function (considering an aggregated two goods situation of \( N_h \) and \( H \)) defined as:

\[
U = u(N_h, H) \quad (2)
\]

Under the neoclassical framework, the individual faces a budget constraint on the level of income given as \( y \) (disposable income) and the level of prices for the non-health market commodities as \( p \). The affordable combination of bundles of consumption is defined by the budget line given these prices. According to Fisher (1996) and Hanemann (1991b), the individual maximizes utility by choosing the level of provision of \( N_h \) but not \( H \) as this is out of her immediate control. Therefore, the individual aims at maximizing the utility function given by Equation (2) subject to the budget constraint. This implies solving Equations (3) and (4) taking the value of \( H \) as given (fixed).
\[
\max_{N_h} u(N_h, H) \tag{3}
\]

Subject to:
\[
\hat{a}_{i, p, N_h} \leq y \tag{4}
\]

Solving Equations (3) and (4) yield sets of ordinary demand equations defined by Equation (5)
\[
N_{hi} = w_i(p, H, y), \quad \text{for } i = 1, 2, \ldots, n \tag{5}
\]

and an indirect utility function for the individual as:
\[
V = v(p, H, y)^o \circ u[h(p, H, y), H] \tag{6}
\]

which obeys the conventional properties of utility measures\(^{10}\). The indirect utility measure presented in (6) is, therefore, non-decreasing in \(H\). Where \(y\) is the disposable income of the individual. Assuming that \(y > 0\), the indirect utility function can then be used to obtain monetary values of changes in health state.

Following the formulation by Mäler (1971; 1974) extending Hicks (1943) standard theory of measuring welfare for price changes to measuring changes in quantity of a given commodity, it can be assumed that \(H\) changes from \(H^0\) to \(H^1\) (where \(H^1 \neq H^0\)). Therefore, the utility function of the individual changes from \(u^0 = v(p, H^0, y)\) to \(u^1 = v(p, H^1, y)\) where the price vector, \(p\) is assumed to remains constant for a simplistic analogy. Following from this, as an analogy of the Hicksian measure for price changes, Mäler derived the compensating variation \(CV\) and equivalent variation \(EV\) measures of welfare changes. These measures are mathematically represented as:
\[
v(p, H^1, y - CV) = v(p, H^0, y) \tag{7}
\]
\[
v(p, H^0, y + EV) = v(p, H^1, y) \tag{8}
\]

Equations (7) and (8) define the compensating and equivalent variations respectively of welfare changes.

The \(CV\) or \(WTP\) defined in (7) is analogous to the gap \(Y_0 - Y_1\) defined in Figure 1. This implies that the maximum amount individuals are WTP for the prepayment scheme to obtain the predetermined benefit package is defined by \(CV\) out of their disposable income \(y\), while the individual or household as the case may be, still maintains the same level of utility or state of wellbeing (Varian, 1992; Mas-Colell et al., 1995; Johannesson, 1996).

\(^{10}\) For a thorough discussion of these properties, see for example Mas-Colell et al. (1995) and Henderson & Quandt (1980).
Review of the Application of CVM to Health and Health Insurance Valuations

WTP for health and health related interventions by households and individuals is related to factors such as household demographic factors (age, sex, family size, etc); socioeconomic factors (income, wealth, employment, level of education, etc.); health and health related factors (state of health, illness experiences, etc.); and rural characteristics (nature of dwellings, distance to health facilities, etc.) among others (Bala et al., 1999; Dong et al., 2003a, 2003b; Asenso-Okyere et al., 1997; Asgary et al., 2004; Olsen et al., 2004; Binam et al., 2004). In eliciting WTP amounts in contingent valuation studies, the household rather than the individuals have been adjudged to be a better enrolment unit (Dong et al., 2004a, 2005) because most of decision on consumption and expenditure in a household is done via the family as a collective group.

The guidelines and methodology of contingent valuation though originally applied in the field of environmental economics (Arrow et al., 1993; O’Brien & Gafni, 1996) has been used for years in valuing health benefits and dates back to 1970s (Smith et al., 1999c; Asgary et al., 2004). Its use, though not only limited to developed countries, is relatively few in the area of health insurance in developing countries (Diener et al., 1998; Asgary et al., 2004). WTP responses have been used in ordering preferences and aid in decision making for policy makers in the light of alternative interventions and in deciding on an intervention programme (Asgary et al., 2004; Olsen et al., 2004; Cranfield & Magnusson, 2003; Dong et al., 2004b) and also forms a basis for a more comprehensive Cost Benefit Analysis (CBA) of alternative interventions and programmes competing for limited funds. Extensive literature exists in the area and field of environmental economics (see Fonta, 2006; Fonta & Ichoku 2005a; 2005b).

Most of the studies carried out in the field of health economics have focused on evaluating specific benefits from health care interventions and programmes using the willingness to pay (WTP) approach. Some of such recent studies include Onwujekwe et al. in south-eastern Nigeria valuing retreatment of mosquito nets with insecticide in four communities, and also valuing community-based ivermectin distribution; Protière et al. valuing the WTP for three health care programmes (more heart operations, a new breast cancer treatment and a helicopter ambulance service) testing specifically for the impact of variation in information; Bala et al. valuing different health benefits for a comprehensive CBA; Walraven valuing WTP for health services in a district hospital in Tanzania; Weaver et al. valuing the WTP for child survival in Central African Republic, Habbani et al. in Khartoum – Sudan valuing the willingness of the respondents to pay for good quality public health services, which can be used as a means of setting fees to support cost recovery; Mataria et al. valuing the impact of impoverishment on patients’ preferences with respect to improving the quality of health care, by focusing on the sudden impoverishment experience that affected the Occupied Palestinian Territory (OPT) since the beginning of the second Palestinian Uprising of September 2000; etc. (Walraven, 1996; Weaver et al., 1996; Stewart et al., 2002; Olsen et al., 2004; Onwujekwe
et al., 1998, 2000, 2001, 2005; Protière et al., 2004; Bala et al., 1999; Habbani et al., 2006; Mataria et al., 2006) where elicitations were obtained on an ex post basis\textsuperscript{11} (Johannesson, 1996; Olsen et al., 2004).

Olsen et al. (2004), O’Brien & Gafni (1996) and Johannesson (1996) argue that there is theoretical argument as entrenched in welfare economics in favour of the use of ex ante as opposed to ex post basis for elicitation where insurance-based questions are asked in cases where the actual need for health care and the eventual outcomes are uncertain. The use of ex post WTP will not be able to mimic the population as only very few of the population have specific information about the disease and treatment required (Johannesson, 1996; see also O’Brien & Gafni, 1996; Bayoumi, 2004). The use of the ex ante (insurance based) elicitation guards against one of the arguments raised by Cookson (2003) about the presence of ‘budget constraint bias’ where respondents are only faced with making a decision about one intervention relative to others they are not asked about. This is clearly evident in the fact that insurance based elicitations factor into the analysis, possible illnesses and the framework builds on dividing income between health and non-health needs. This approach of ex ante elicitation as adopted in this research is quite of relevance as it is aimed at eliciting from the individuals or households, amounts they will be willing to pay as ‘premiums’ to mitigate the catastrophic nature of health care payments especially when the need arises and the immediate payment out-of-pocket (OOP), will push the household below the initial welfare state.

In the area of health insurance and community pre-payment schemes, studies carried out include Dong et al. (2003a) in Burkina Faso estimating WTP for community-based insurance; Binam et al. (2004) in rural Cameroon valuing the WTP for community prepayment scheme; Dong et al. (2004b) also in Burkina Faso analysing the differences in WTP of household heads for community-based health insurance premiums for themselves and other members of the household; Asenso-Okyere et al. (1997) using the large informal sector of Ghana to value WTP for health insurance; Dong et al. (2003b) comparing gender effects of WTP in Burkina Faso for a community-based health insurance scheme; Mathiyazhagan (1998) in rural India valuing the willingness of rural households to pay for community health insurance arrangements through community involvement and participation; Jiang et al. (2004) in China estimating the willingness to pay for Rural Cooperative Medical Scheme (RCMS); Asgary et al. (2004) in Iran estimating rural household’s WTP for health insurance; Asfaw & von Braun (2004) investigating into the plausibility of community health insurance on poor rural households of Ethiopia; Gyldmark & Morrison (2001) elicit ing the willingness to pay for private insurance covering treatment for four different health problems [mild hypertension (high blood pressure), old persons’ diabetes, a broken wrist, and cancer of the uterus]. These studies conducted to obtain WTP amounts in the area of health insurance have adopted various

\textsuperscript{11} This relates to where patients have had or are currently presenting the condition of interest but the eventual outcome of the condition as to improvement or deterioration is uncertain.
methods of elicitation of WTP responses ranging from take-it-or-leave-it process or the simple dichotomous choice method (Dong et al., 2004b; Asfaw & von Braun, 2004); iterative bidding game process (Asgary et al., 2004; Dong et al., 2003b, 2004a, 2004b, 2005; Binam et al., 2004); open-ended method (Jiang et al. 2004); to a more or less informal elicitation mechanism such as the combined use of focus group discussions (FGDs), in-depth interviews, and a general assessment mechanism of whether households are willing to join in the scheme or not (Asenso-Okyere et al., 1997). Other techniques such as the payment ladder approach, the more recent structured haggling technique (Onwujekwe et al., 2005) and the stochastic payment card (SPC) approach (Wang, 1997; Wang et al., 2004; Wang & Whittington, 2005) have not been found in literature to be used for eliciting WTP insurance based responses from respondents.

Among the variables identified to influence the payment decisions of the respondents is age as Binam et al. (2004); Asenso-Okyere (1997) and Asgary et al. (2004) found that older respondents are more willing to pay higher amounts than do younger household respondents while Dong et al. (2003b; 2004b) and Jiang et al. (2004) found the reverse. Income was also reported as a major variable which explains the payment decisions of households as Dong et al. (2003a; 2003b), Olsen et al. (2004) and Asgary et al. (2004) found that richer households/individuals are more willing to pay higher amounts than poorer households/individuals while Asenso-Okyere et al. (1997) reported a negative relationship between income levels and the WTP of respondents. Distance to the nearest health facility also plays an important role in the payment decisions of households as Asgary et al. (2004) and Asenso-Okyere et al. (1997), reported a positive relationship. However, Jiang et al. (2004) and Dong et al. (2003b & 2005) reported a negative relationship. Most of these studies have produced plausible results where the introduction of such schemes can help protect the poor and vulnerable against the adverse effect of out-of-pocket payments for health care. Binam et al. (2004) in Cameroon obtained results that falls within the average cost of treatment in poorer households as reported by the Cameroonian National Statistics. Similarly, Asgary et al. (2004) obtained results that were found to be relatively adequate in catering for the average household expenditure on health care in rural Iran. Despite the low level of resource generation, it is possible for these schemes to generate some resources that can be helpful in curbing the adverse financial effects of ill health especially during the time of occurrence and immediate sourcing of funds is difficult (Asfaw & von Braun, 2004) since the payment for health care is usually forced payments (Whitehead et al., 2001) especially in the absence of insurance.

As lacunae, in most CVM studies, protest votes as responses have traditionally been omitted from analysis, which may result in biases of various forms. In most of the literature estimating the willingness to pay for community health care financing, analyses has been based on the non-protesters without testing for the presence of sample selectivity bias as has been noted in most survey based elicitation (see for example, Strazzera et al., 2003a; Calia &
Strazzera, 2001). There is thus a need to test to know if those who actually indicate zero values are actually true zeros or not. This implies testing the difference between the protesters and the non-protesters\textsuperscript{12} to see if statistically, these two groups are different even in terms of socio-economic, health and demographic characteristics or covariates used. This, therefore, necessitates the use of sample selection estimators.

Method of payment that has been used in traditional analyses in health insurance CVM studies has been in direct monetary terms. Preker \textit{et al.} (2001) and Dave (1991) have found out that in Philippines and India respectively, payment in-kind (community labour, agricultural commodities, etc.) have been accepted for some community based health financing schemes, which have increased access to health care. There is, therefore, need to extend analysis to consider payment in-kind such as the study by Asfaw \& von Braun (2004) that considered payment in labour hours. This is because most of these communities are agrarian hence there could be perceived need to use agricultural commodities as the payment vehicle or medium. Community members can therefore be allowed to make contributions into the fund in terms of kind such as agricultural produce and/or labour hours.

**Uncertainty in contingent valuation**

Decision of a respondent in a CV study is usually associated with uncertainty (Wang \& Whittington, 2005). This uncertainty is in terms of the nature of the good under study, the characteristics of the market under provision, the socio-economic and demographic characteristics of the respondents, and as a result of the respondent’s preferences (Wang \textit{et al.}, 2004) and also as a result of the researcher. Various methods have arisen to handle mainly uncertainty about the consumers’ preferences as it relates to the answer provided, which is linked to the ‘top-down’ or ‘stored-rule’ decision argument raised by Hanemann (1994:28) and uncertainty induced by the researcher with only few others on uncertainty in specifying a single bound value (see Wang and Whittington, 2005).

Novel application and incorporation of uncertainty in CV about individuals’ preferences was implemented by McFadden (1973) using a random utility maximization (RUM) framework (see Shaikh, \textit{et al.}, 2005). While most of later developments in this area still revolves round uncertainty in individual’s preferences about the stated amount, using a dichotomous choice method, Hanemann and Kriström (1995) argue for the use of the open-ended elicitation format rather than the \textit{take it or leave it} format if the respondent truly knows her valuation about a contingent good (see Shaikh, \textit{et al.}, 2005) which is rarely the case. Since others have argued that respondents do not know with certainty their valuation (see Wang \textit{et al.}, 2004; Wang \& Whittington, 2005; von Kooten \textit{et al.}, 2001), it is rather important to model as a random variable, the value an individual places on a good.

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\textsuperscript{12}Protesters and non-protesters as used here imply those who are categorized as invalid and valid respectively. Valid responses are those with positive WTP amount while the invalids are those who are identified by the definition of the protest votes.
In literature, the various approaches that have arisen to handle the issue of uncertainty include the Weighted Likelihood Function Model (WLFM) first implemented by Li and Mattson (1995) under the assumption that the respondent has a true valuation of the amenity or good, \( v_i \), but lack full information about this value and researchers only estimates the value as 
\[
\theta_i = v_i + x_i + e_i \quad \text{with} \quad x_i \quad \text{and} \quad e_i \quad \text{representing a random disturbance term from uncertainty of the respondent to the answer provided and the researcher respectively. While the researcher’s uncertainty is handled as in a standard RUM, the respondent’s preference uncertainty is handled with a post-valuation follow-up question on a \{0%, 5%, 10%, 100%\} scale that increases on an interval of 5% used in weighting the dichotomous choice responses in a likelihood function. Another alternative approach of incorporating the post-valuation follow-up responses is the Asymmetric Uncertainty Model (ASUM) by Champ et al. (1997). Under this framework, a scale of \{0, 1, 10\} is used with 0 (very uncertain) and 10 (very certain) for eliciting responses as to how certain an individual is in the payment of the stated amount. Under this framework all ‘yes’ responses i.e. \( y = 1 \) are recoded as ‘no’ responses if the answer to the follow-up question is close to or equal to 0 (zero). Though this model seem elegant, it is subject to certain flaws such as the influence of extreme values and the possibility of lack of certainty in stating a ‘no’ response especially where further follow-up questions to debrief are not used.

As a modification of the ASUM, a symmetric model is proposed by Loomis and Ekstrand (1998). This symmetric uncertainty model (SUM) unlike the asymmetric model preserves the ‘yes’ or ‘no’ responses of the respondent from the dichotomous choice question but also use a similar rating scale of \{1, 2, 10\} for the follow-up post-valuation question and the traditional dichotomous dependent variable is recoded over a continuous \([0, 1]\) interval. A ‘yes’ and ‘no’ response with perfect certainty takes on 1 and 0 respectively as the value of the dependent variable. A ‘no’ response with a follow-up certainty response of 30% is coded 0.70 while a ‘yes’ response with a certainty response of 60% is coded 0.60 as the values of the dependent variable and the model is estimated with a maximum-likelihood procedure.

Wang (1997) moving away from consideration of uncertainty in terms of preference statement proposed a Random Valuation Model (RVM), which assumes that the value placed by individuals on a good or service is a random variable with an underlying probability distribution rather than a single point valuation. The respondent in this case is assumed to accept payment for the good if the latent WTP is greater than the offered bid amount and declines payment if otherwise. In the formulation, a third option ‘don’t know’ (DK) is added to the traditional ‘yes’ and ‘no’ options and the respondent is assumed to respond a DK if the latent WTP lies within a threshold \( S_1 \) and \( S_2 \) representing lower and upper bounds of the DK option respectively. This method does not use the follow-up questions since the DK option is added. The model formulated from this method is usually handled by an ordered probit model.

\[13\] 1 is used for ‘not certain’ and 10 for ‘very certain’
As an extension to this model, Wang et al. (2004) and Wang & Whittington (2005) proposed the use of a stochastic payment card design for elicitation in place of the earlier referendum answers with the DK option included. Under this model, the respondent is presented with a card containing a likelihood matrix of probabilities (or certainty levels) as ‘definitely yes (100%)’, ‘probably yes (75%)’, ‘not sure (50%)’, ‘probably no (25%)’, and ‘definitely no (0%)’ and corresponding bid amounts and the respondent is allowed to make a choice of probability for each of the bid amounts on the card. A simple transformation is used to obtain an expression for the mean and the variance under a distributional assumption. A probit or logit model is used to determine the factors that affect the mean and variance depending on the distributional assumptions made. Another similar extension of the Wang & Whittington (2005) model is the Multiple-bound Discrete Choice Model (MBDCM) by Welsh & Poe (1998) and Alberini et al. (2003).

Another model for uncertainty in CV is the Fuzzy Model (FM) proposed by van Kooten et al. (2001) which also assumes like Wang, that the respondent does not know with certainty, the exact value of the good under valuation. Under this model, the respondent only knows two thresholds (i.e. the level below which she is certainly WTP and the level above which she is willing not to pay (WNTP)) making these bounds of choice seeming to the fuzzy sets (see Shaikh, Sun and van Kooten, 2005). Fuzzy membership functions for WTP and WNTP are estimated with the use of follow-up questions about the level of certainty the respondent is with regards to her response to the valuation question and the intersection of these functions gives the level of ‘comfort’ of the welfare estimates. Under this model, rather than assuming that the respondent has knowledge of the distribution of the true value of the good, it is assumed that the respondent’s latent WTP is a member of both the WTP and the WNTP Fuzzy sets simultaneously14 (van Kooten et al., 2001; see also Shaikh, Sun and van Kooten, 2005).

The assumptions inherent in the models of WLFM, ASUM and the SUM where a dichotomous choice question is used under the assumption that the respondent knows the exact value of the good under valuation and treating that as a single valued function makes its application of little relevance in this paper. This is because the basic assumption we make is that an individual has a valuation distribution over certain range of values or bid amounts. Similarly, the Fuzzy Model promises a good estimation but for the strong assumption of individual’s responses can be simultaneously coded into the WTP and the WNTP Fuzzy sets which might not necessarily be the case as individuals may be WNTP a specified amount at a lower certainty level and this cannot translate to a WTP Fuzzy set with a higher certainty level as the respondent might be WTP an amount lower or higher than the offered amount. This

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14 Here a respondent who is 30% certain of a ‘yes’ response is assumed to be 70% certain of a ‘no’ response. A weighting procedure is used such that for an individual \(j\), \(w_j = 0.3\) when \(y_j = 1\) or \(w_j = 0.7\) when \(y_j = 0\) but not both. This implies that the respondent \(j\) is a member of the WTP fuzzy set with a membership value of 0.3 and a member of the WNTP fuzzy set with the value 0.7.
study, employing variants of the methodologies employed by previous research, apply the Stochastic Payment Card design in Health care CVM and also carry out a study of willingness of rural communities in Nigeria to pay for health insurance schemes as it is the first of its kind applied to the field of health valuation and also in Nigeria.

3. Methodology

“Rather than suggesting that there is one universally correct approach to eliciting WTP-values, we would hold that it is the issue and the policy context that should determine the chosen approach” (Olsen et al., 2004: 226).

Study Population and Design

The study population for the research is rural households in Nsukka Local Government Area (LGA) of Enugu State of Nigeria with a projected population of 254,442 (1996) (NPC, 1996). Nsukka LGA is located in the northern part of Enugu State, south-eastern Nigeria. It consist of 15 communities with the following populations: Anuka (776), Okutu (4,022), Ibagwa-agu (1,304), Okpuje (9,259), Ibagwa-ani (9,443), Okpaligbo (2,500), Obukpa (20,056), Aloruno (6, 530), Edem (16,661), Obimo (12,753), Lejja (15,325), Ede-oballa (14, 368), Opi (25, 384), Ehalumona (36, 129) and, Nsukka (79, 913). In 2003, there were two general hospitals run by Enugu State Government, 20 primary health clinics run by Nsukka Local Government, 20 private and mission hospitals, 25 private maternity centres, 11 private clinics and, a medical centre which is located in the University of Nigeria (Ichoku & Leibrrandt, 2003). The choice of the study area, though not random is a result of the researcher's prior knowledge and familiarity with the area, which according to Deaton (1997), enhances the accuracy of the data to be obtained, at least to a certain degree, the econometric estimates obtained thereof and this strengthens the efficiency of the statistical inferences to be drawn about the study population. Other consideration factors include budget constraint and cost of covering a larger expanse of area. Such small area analysis has been justified to yield robust results than those that attempt to cover a larger area (see for example Diaz, 2002) due largely to diminishing accuracy and multiplication of errors. The study is purely a cross-sectional design.

Data Requirements, Sources and Sample size

Contingent valuation studies of this nature require the use of primary sources of data usually through interviewer-administered structural questionnaires (see Smith et al., 1999b). Information elicited from rural household heads includes information on health variables, socio-economic characteristics, environmental and dwelling characteristics, and the WTP question (both the dichotomous choice and the stochastic payment card)\(^{15}\). Specifically for analysing willingness-to-pay using the dichotomous choice method, data requirements include eliciting the amounts households are willing to pay (cash and/or commodities)\(^{16}\) and debriefing

\(^{15}\) See Table 4 for description of the variables elicited.
\(^{16}\) For the use of commodities, the current market prices of the commodities were used as weights attached to the various commodities before aggregation.
questions to identify protest responses, which are traditional for a sound contingent valuation study using the dichotomous choice format. For the stochastic card design, in addition to the socio-economic, health and demographic data, probability values are also elicited for constructing the likelihood matrices of individuals.

The sample size for the study is obtained using the Taro Yamane (1967) specification (see Israel, 1992) given as:

\[ n = N / \left(1 + N(e)^2\right) \]

Where \( n \) = the sample size to be estimated
\( N \) = population size (Household size) and
\( e \) = error margin

Using an error margin of \( e = 5\% \), the desired optimum sample size as \( n = 398 \) households where \( N = 66,400 \). The figure was then rounded-up to 380 households, which were then administered the questionnaire.

**Data collection tool**

The data collection tool is an interviewer-administered structured questionnaire, translated to the local language (Ibo) of the community and was administered to household heads by trained enumerators. It is divided into two broad sections. The first section of the questionnaire consisted of questions eliciting from the respondent, general household and personal information including demographic characteristics, health, assets, housing and wealth information and willingness of community participation. The second section which formed the crux of the questionnaire administers the contingent valuation questions (the dichotomous choice and the SPC design) after presenting to the respondents the scheme’s scenario. The interview schedule was so structured to start with easy and less-threatening questions linked to the study then in the middle, questions which enhances the confidence of the respondent are asked, which provides the context for the valuation questions which follow immediately (see for example Green & Tunstall, 1999).

The elicitation format used in eliciting the amounts household heads will be willing to pay into such scheme is the Dichotomous Choice (DC) with open-ended follow-up questions\(^{17}\) that involve debriefing questions\(^{18}\) and the Stochastic Payment Card approach. The choice of the DC elicitation format is because of its incentive-compatibility feature compared to other formats (Mitchell & Carson, 1989). Similarly, Dong et al (2004b) noted that the DC format is appropriate and more feasible if literacy level is quite low as is the case of the rural study population under consideration. The open-ended question format was, therefore, avoided because it is less reliable (Hanemann, 1991b) and lacks incentive compatibility even though the open ended format is recommended by Smith et al. (1999b). The Stochastic Payment

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17 Follow-up involves asking the respondents who are not WTP any amount debriefing questions to obtain likely reasons for not WTP. This is very important especially in the analysis stage to differentiate between true zeros from protesters.

18 These debriefing questions are important questions often used to categorize responses into protesters and non-protesters.
Card was used in incorporate uncertainty in CV studies. The pre-payment scheme scenario described in detail to the respondent included the nature of the scheme, the organisation, the membership criteria (which also included the frequency and method of payment (payment vehicle) into the scheme) and the expected benefits. The bid vector used for the DC approach involved 5 prices ranging from N200, N400, N600, N800 to N1000. See Appendix I for a sample of the DC design. These bids were based on an earlier pilot study, which could be considered as pre-testing in the language of Bonato et al. (2001) and the amounts paid by households who are members of any form of pre-payment schemes that were not necessarily health care pre-payment schemes. These prices were assigned randomly and roughly proportionately to the number of households in the study sample. For the Stochastic payment Card design, the bid vector used include N0, N200, N400, N600, N800 and N1000 with the following assigned probability values for each of the bid amounts ‘0% (definitely no)’, ‘25% (probably no)’, ‘50% (not sure)’, ‘75% (probably yes)’, and ‘100% (definitely yes)’. See Appendix II for the sample of the stochastic payment card design.

**Description of the nature of the proposed community health pre-payment scheme (Contingent Market)**

With reference to Smith et al. (1999a), the contingent market designed ensured compliance with the standard contingent market for a valid CV study.

Most of the time when people fall sick, they tend to adopt various ways of coping with such an event this includes selling off personal belongings like animals, electronic gadgets, and if intense, land and landed property. Sometimes also, households tend to resort to borrow money from their neighbours, the church or religious organization or friends. This is because there is always a desire to get better again and if possible, quickly. If the individual or household fails in obtaining financial help, often times the sick individual has no option than to remain in the state and begin to deteriorate. Others decide at this point to go for cheaper alternatives, which might not be efficacious such as the use of traditional healers and medical practitioners. The scenario is also worse if the family finally obtains financial assistance only to discover at that point that the sick individual has given up.

Given the nature of health care financing and the increased burden of diseases facing the rural poor in Nigeria, a [hypothetical non-governmental organisation (NGO)](hypothetical) is proposing a community health pre-payment scheme to the rural dwellers. The scheme, which will have designated public health centres as points of utilization will be managed by several committees comprising community members selected from the community. The bulk of the premiums which are paid at the beginning of every quarter of the year is kept in the bank and managed by the financial committee while part of the premiums paid will be retained to serve for immediate payments for items such as transportation, drugs and laboratory tests. To ensure financial accountability, the committee will from time to time give an up-to-date

19 The term hypothetical is used to signify the contingent nature of the market construct.
20 The committees include the financial and management committees, emergency committee, etc.
financial situation to the community. To further ensure the success of the scheme, a community health worker (CHW) will be stationed at each of the designated health centres to ensure that only those who contribute into the scheme receive their benefits. To be eligible, a household is expected to pay a specified amount (premium) quarterly for a year to be able to receive health services for the period of a year. Once a member of a household (usually, household head) has paid into the scheme, all household members will be given a membership card that identifies them with all personal information and the same membership number for the household which then entitles them to benefits$^{21}$ that include consultations, diagnosis and laboratory tests, maternity, antenatal and postnatal care, family planning, cost of prescribed drugs under the Essential Drugs List (EDL), minor accidents, treatment of snake bites, cost of in-patient days for up to 30 days for any member of the household, minor surgeries such as appendectomy and caesarean sections but excludes heavy cost treatment such as plastic surgery at any of the designated public health centres. Any other services not covered by the scheme will be borne by the household but the main idea is to cover the basic health care needs of the poor, which include malaria and typhoid fever, tuberculosis, and diarrhoea.

This will help to (1) increase access/utilization of health care services at the time of need, (2) reduce the effect of poverty amongst community, (3) increase community ownership of such scheme and reduce fund misappropriation and (4) increase productivity of rural workers (including farmers) from the effect of sick days and need to cater for the sick rather than engaging in productive activities.

There are however a number of community prepayment schemes that are engaged mainly by rural Nigerian women and these are not necessarily health related schemes but serves as a means of providing savings against major ceremonies such as the Christmas, wedding ceremonies, and unforeseen occurrences such as death of a family member and payment into the schemes is made weekly or monthly. In the South western Nigeria, for instance, there is a prominent prepayment organisation known as the Country Women Association of Nigeria (COWAN) run predominantly by rural women to empower women and promote self-sufficiency. It is financed by contribution into the Health Development Fund (HDF) similar to the proposed health insurance scheme but its major assistance is providing interest free loans to households (see Ogunbekun, 1996).

**Analytical Framework**

The National Oceanic and Atmospheric Administration (NOAA) provides a basic guideline for conducting contingent valuation studies in environmental resources damage (Arrow et al., 1993) but in the area of health economics, researchers have been sceptical about its use (Stewart et al., 2002). In its simplest framework, the NOAA advocates the use of

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$^{21}$ These benefits were so chosen to be similar to those proposed for the RCSHIP to ensure that the amounts to be elicited do not vary from those intended for the scheme.
the Dichotomous Choice Method (DCM) based on the grounds of compatibility with larger sample sizes for reliability (Arrow et al., 1993; Stewart et al., 2002). Following Donaldson et al (1998), when closed ended questions are asked as is the case with the DCM, the appropriate limited dependent variable model (LDVM) will be the use of logit or probit models depending on the underlying assumptions made about the distribution of the error term (Maddala, 1983; Wooldridge, 2002; Greene, 2003). Often times, the choice of either the probit or logit model depends on the preference of the researcher.

However, as noted by Fonta (2006: 58-59), these two models using the normal and the logistic functions have some practical limitations especially in the application to CVM studies. The limitations include: (1) Having information on $x$ (vector of regressors) for only some observations giving rise to a censored sample problem; (2) We may also record large numbers of $y = 0$ responses giving rise to an item non-response problem; (3) If the procedure for discarding $y = 0$ responses in (2) above is non-random as usually the case, we run the risk of encountering a sample selection bias problem; (4) Because peoples’ economic valuation process of almost all classes of market and non-market goods and services is characterized by uncertainty, applications of the above models may also be limited in this regard. With these limitations, two econometric models that are considered very relevant for this analysis are the sample selection, and random valuation models and a comparison of the results obtained from either of the models.

Framework

As a general framework for the analysis, the various blocks representing the links between variables and factors identified to influence households' willingness to participate in the health prepayment schemes are presented in Figure 2. Avoiding complexities, we present the basic idea, which is of much relevance to understanding the research. From Figure 2, three basic divisions or levels are identified. They are the community, the household (or individual) and the product of the interaction between the individual (which not necessarily mean a single individual but can be extended to the household as a whole) and the community which produces the valuation of interest. Within these divisions, various blocks are presented and how they are possibly interlinked. From the household level, the various blocks – demographic factors, health related factors, socioeconomic factors and other factors – influence the amount households are willing to pay for the establishment of the community prepayment scheme. These factors have to be evaluated based on certain probabilistic statements such as the number of household members, the state of health of household members, level of income and wealth, experience with other forms of prepayment schemes, level of education attained, experiences with illness and the ill-effect of such illness in terms of payments, certainty about the scheme, and so on by the household which produces their valuation and it also incorporates the nature of the good under valuation. The socio-economic and rural characteristics of households identify them within the community they live. This
implies that these characteristics give the household social inclusion within the community. The tendency to maintain the social status and still gain community inclusion also affects households' stated amount to pay. Interactions also occur between rural characteristics and socioeconomic factors. This is evidenced from the fact that choice of dwelling is sometimes dependent on the nature of employment and even to a greater extent the amount of earnings of the household. Similarly, socioeconomic factors such as income, employment level and level of education also influence the health status of household members as evidenced from the link between poverty and health, and health status can also affect the productivity of households by either limiting productivity during ill-health or increasing it the absence of ill-health.

In analysis, therefore, factors that interact among themselves to influence the amounts households are willing to pay will be explored, which implicitly incorporates households' probabilistic valuation to determine the nature of the relationship and which of the factors have a significant impact on the amounts households are willing to pay. From these factors, the average amounts households will be willing to pay will be obtained through the use of statistical analysis including also the Random Valuation Method.

Figure 2: Basic Framework of analysis


**Willingness to Pay Models**

In the dichotomous choice (DC) with open-ended follow up questions, the use of sample selection models\(^{22}\) for modelling the two joint decision processes of the respondent is suggested (Strazzera *et al.*, 2003a). Modelling the decision process of the respondent using the joint or linked processes, which involves the decision of either participating or not, and the revelation of the reservation price, we formulate one of the equations as the choice of participating or willing to pay or not, which is a binary decision process and the second equation as the outcome, valuation or WTP equation for only the non-protesters correcting for the selected sub-sample of participants. The basic idea behind the formulation is letting a dummy variable (for the participation equation) take on the value of 1 if we have information on the respondent’s reservation price and zero if otherwise; thereby defining another variable (which need not necessarily be a dichotomous variable\(^{23}\)) that is now representing the response from the open-ended follow-up question conditional upon the initial dichotomous variable assuming the value of unity (non-protesters) for the valuation equation. This is because if such responses (protesters) are excluded from the analysis on *ad hoc* basis, we run the risk of encountering a selection bias problem, which may sensibly affect the final WTP results and welfare estimates for purposes of inferences. In order to address this problem, we shall use a sample selection model in the fashion discussed by Strazzera (2003a); Calia & Strazzera (2001).

Let \(Y_2\) represent the revealed amount by the respondent and \(Y_1\) denote a dichotomous variable which assumes the value of unity if we have information pertaining to the respondent’s mean WTP and 0 if otherwise\(^{24}\). Let also \(z\) and \(w\) represent the vector of covariates (socio-economic and health characteristics, etc.) for the valuation and the selection equations respectively (which may or may not be different), we may then formulate the following representations using a bivariate model as:

\[
\ln Y_{2i} = \begin{cases} 
  z\beta + s m & \text{if } Y_1 = 1 \\
  \text{unobserved} & \text{if } Y_1 = 0 
\end{cases} \tag{9}
\]


\[
\ln Y_{2i} = \begin{cases} 
  z\beta + s m & \text{if } Y_1 = 1 \\
  \text{unobserved} & \text{if } Y_1 = 0 
\end{cases} \tag{9}
\]


to represent the logarithmic transformation of the revealed amount which yields the (log)WTP equation, where \(s\) is a scale factor, as the valuation equation.

---

\(^{22}\) The sample selection model framework takes into account the fact that the value elicited from individuals is a result of two separate possibly correlated stochastic processes. This is interpreted as: the individual assigning a value to the good under consideration according to some underlying choice model, and also decides whether to disclose such assigned value (which in this case is the reservation price or the maximum amount the individual is willing to pay) or not according to another choice model (Strazzera *et al.*, 2003a; see also Heckman, 1979). This implies the estimation of two separate but linked equations which can be termed the selection or participation and the valuation or outcome equations.

\(^{23}\) If the variable becomes a binary variable, the estimation procedure simplifies to a bivariate probit model usually handled by hecprob in stata.

\(^{24}\) This dichotomous variable is obtained as the valid response to the WTP question.
representing the selection equation. From Equations (9) and (10), \( Y_2 \) is observed only when \( Y_1 \) is unity. \( m_1 \) and \( e_i \) are two error terms with joint cumulative density functions c.d.f. \( F[m_1, e_i] \), which is assumed to have a bivariate normal distribution with zero mean, unit variance and correlation \( \text{corr}(m_1, e_i) = r \). In the absence of sample selection problem, the parameters of Equations (9) and (10) can be estimated separately. Sample selection problems arises, therefore, when \( r \neq 0 \). In other words, these two processes are not separate. Expressing the conditional expectation of the log of WTP \( \ln(Y_2) \) on \( Y_1 = 1 \), we obtain:

\[
E(\ln Y_2 | Y_1 = 1) = z \Phi + r s l(w \phi^i) \tag{11}
\]

where \( l(w \phi^i) = \frac{f(w \phi^i)}{F(w \phi^i)} \) represents the inverse of the Mills’ ratio; \( f \) and \( F \) are the density and distribution functions for the standard normal variable respectively.

It follows from Equation (11) that estimating the respondents mean WTP based only on observed responses where \( Y_1 = 1 \) (i.e., those with likelihood matrices or non-protesters) could be incorrect if there is bias introduced by self-selection of individuals that protested as can be observed from the last component on the RHS of the equation. Thus, to check the presence of sample selection bias, the two choices can be modelled simultaneously (Calia & Strazzera, 2001, Strezzera et al., 2003a) using the Heckman 2-step procedure, Maximum Likelihood estimation, etc. In empirical estimations of this nature, there may exist the problem of endogeneity that are usually handled with the use of valid instrumental variables (IVs). The study, however, lacked valid IVs that satisfy the necessary conditions of an IV.

For the Full Information Likelihood (FIML) estimation, we set up a likelihood function following Strazzera et al. (2003a) as:

\[
\ln L = \sum_{i=1}^{n} \left[ \ln F(-w \phi^i) + \sum_{j=1}^{n} \left( I_{ij} \ln F\left( \frac{\ln Y_{ji} - z \phi^i}{s} \right) \right) \right] I_{ij} \ln \frac{\ln Y_{ji} - z \phi^i}{s} + I_{i} \ln F\left( \frac{\ln Y_{ji} - z \phi^i}{s} \right) / \sqrt{1 - r^2} - I_{i} \ln s \tag{12}
\]

Maximization of the Log-likelihood function yield sets of simultaneous equations of the parameters of both the Valuation (WTP) and the selection equations. However, note that if \( r = 0 \), then Equation (12) can be split into two parts: a Probit for the selection equation and an OLS for the outcome equation (see Breen, 1996).

In most applied empirical researches involving sample selection bias, the Heckman 2-step procedure has been widely used because of its computational simplicity compared to the
FIML and also due to lack of convergence of the FIML computations (see, Strazzera et al., 2003a). However, Heckman’s procedure often performs poorly in the presence of collinearity between the covariates of the two choice processes hence the need to further test for the presence of collinearity in the Heckman’s 2-step procedure and justify the use of the FIML estimator (Strazzera et al., 2003a). To test for collinearity, Strazzera et al. (2003a) suggest testing the significance of the $R^2$ obtained from the least squares (OLS) estimation of the IMR on the covariates of the WTP or valuation equation. A high value of $R^2$ is an indication of collinearity. Strazzera et al. (2003a) provides a sequential basis upon which the choice among estimators (OLS, Heckman 2-step and FIML) should be based.

After the estimation of the parameters of the valuation equations with any of the standard econometric or statistical software as Stata 9.2 in this case, we also obtain the mean and median WTP. According to Strazzera et al. (2003a), given the lognormal distribution of the variable $Y_2$ with parameters $\xi$ and $\sigma$, the estimate of the median and mean WTP will be obtained by the expressions:

\[
\text{Median} = \exp(\xi) \quad \text{and} \quad \text{Mean} = E(Y_2) = \exp(\xi + \sigma^2/2)
\]

In the analyses for the use of commodities, income/wealth measure was categorized into three as shown in Table 3 and is used as a categorical variable.

<table>
<thead>
<tr>
<th>Wealth measure (N) (annual)</th>
<th>OBS (All)</th>
<th>OBS (Valid)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wealthmeasure1 &lt; 60,000</td>
<td>111</td>
<td>85</td>
</tr>
<tr>
<td>Wealthmeasure2 60,000 – 120,000</td>
<td>73</td>
<td>63</td>
</tr>
<tr>
<td>Wealthmeasure3 &gt;120,000</td>
<td>125</td>
<td>98</td>
</tr>
<tr>
<td>Total</td>
<td>309</td>
<td>246</td>
</tr>
</tbody>
</table>

* Number of observations.

**The Random Valuation Model**

With uncertainty as an inherent characteristic of economic valuation process which is rarely fully resolved by the respondent (Wang, 1997), this model assumes that the value placed by individuals on a good or service is a random variable with an underlying distribution rather than a single point valuation in most traditional CVM methodologies (Wang, 1997; Wang & Whittington, 2005) which is a result of uncertainties in responses to CV questions, where the respondent is assumed to have incomplete knowledge about their true valuation of a commodity that may result in vague answers to the DCM elicitations (See Wang &

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26 Another test suggested is the use of condition number (see, Strazzera et al., 2003a).

27 It involves estimating a 2-step model controlling for the significance of the IMR ($l$). If the coefficient on $l$ is significant, check for collinearity between the regressors from the two equations (valuation and selection). If there is no presence of collinearity and the coefficient on $l$ is not statistically significant, do not reject the estimates obtained from the OLS estimator on the sample of non-protesters. If however there are no collinearity problems but the coefficient on $l$ is statistically significant, do not reject the estimates based on the 2-step procedure. If there are collinearity problems, estimate a FIML sample selection model based on Equation (12) and check for the presence of correlation between the error terms from the separate equations ($r$). If $r$ is statistically significant, do not reject the estimates from the FIML procedure otherwise, do not reject the estimates from the OLS on the sample of non-protesters.
In elicitation, the Stochastic Card approach is suggested by Wang et al. (2004) and Wang & Whittington (2005) where each respondent (a utility maximizer) is presented on a ‘card’ with numerical likelihood corresponding to some qualitative likelihood references such as ‘definitely yes (100%)’, ‘probably yes (75%)’, ‘not sure (50%)’, ‘probably no (25%)’, and ‘definitely no (0%)’ that the respondent will agree to pay a specified amount for the scheme from an array of prices. If a utility maximizer offers answers to at least some of the prices, a likelihood matrix can be observed. This likelihood matrix can be interpreted as a record of the individual’s cumulative valuation distribution function or the individual’s probabilities of accepting different proffered payments (Wang et al. 2004; Wang & Whittington, 2005).

In a typical SPC design set-up, the probability that a utility maximizer with a cumulative valuation distribution function \( F \) would accept the offer presented on the card design at price of \( T \), is given as:

\[
Pr(Yes) = Pr[Y - T, p, H^1, e] = Pr[Y - T, p, H^1, e] > v(Y - WTP, p, H^0, e) = 1 - F(T)
\]

(14)

Where \( v \) represents an indirect utility (i.e., utility at given prices and income); \( Y \) the consumer’s income; \( p \) the price vector faced by the consumer; \( H^0 \) and \( H^1 \) are the alternative health states where \( H^1 \neq H^0 \); \( WTP \) is the respondent’s true value for the scheme while \( T \) is the offered start price in the CVM design.

From equation (14), the cumulative valuation distribution function \( F \), the valuation probability density function, as well as the mean and variance of the probability function, can be estimated with the likelihood matrix data obtained with the SPC approach. To estimate the valuation distribution is straightforward. From equation (14), the valuation distribution is estimated as follows:

\[
P_v = 1 - F[T_v]
\]

(15)

Where, \( P_v \) is individual \( v \)'s probability of agreeing to pay the price of \( T_v \) indicated at the \( f \)th payment point; and \( F[T_v] \) is his/her cumulative valuation distribution function. Under the assumption that \( F[T_v] \) is normally distributed we have:

\[
P_v = 1 - F \left( \frac{\frac{\delta Y - T_v}{\sigma}}{\frac{\delta Y}{\sigma}} \right) = m + sF^{-1}(1 - P_v)
\]

(16)

Then, with each individual’s set of \( T_v \)’s and \( P_v \)'s contained in the likelihood matrix obtained with the SPC design, simple regression can be used to estimate the mean and variance \((\mu, \sigma)\) of each individual’s valuation distribution. Subsequently, regressions can be
conducted to obtain the determinants of mean and variance obtained. However, for individuals whose mean and variance valuation cannot be observed\(^2^8\), if such responses are excluded from the analysis on ad hoc basis, we run the risk of encountering a selection bias problem, which may sensibly affect the final WTP results for purposes of inferences. In order to address this problem, we shall use a sample selection model as discussed and shown in Equations (11) and (12). In actual estimation of the mean and variance functions, 0.001 and 0.999 were used as suggested by Wang et al. (2004) in place of 0 and 1 respectively.

4. Empirical Results and Discussion

Description of sample of population

Table 4 provides a brief definition of the variables used in the analysis and how they were measured.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Gender variable 1 = male and 0, otherwise</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>Educ</td>
<td>Highest attained level of formal education 0 = no schooling; 1 = primary school; 2 = secondary school and 3 = tertiary schooling</td>
<td>Categorical</td>
</tr>
<tr>
<td>Knowinsurance</td>
<td>Knowledge of what health insurance or any form of insurance is all about or the basic concept of insurance 1 = know and 0, otherwise</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>Floormaterial</td>
<td>Nature of floor material 1 = cement/tiles/concrete and 0, otherwise</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>Toilet</td>
<td>Ownership of toilet facility 1 = own and 0, otherwise</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>Bathroom</td>
<td>Ownership of bathroom 1 = own and 0, otherwise</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>Numrooms</td>
<td>The total number of rooms in the occupied building excluding the living/dining room, kitchen, toilets and bathrooms</td>
<td>Discrete (count)</td>
</tr>
<tr>
<td>Wealthmeasure</td>
<td>Proxy measure for income level of households. This includes considering durable assets, household building materials, ownership of livestock, economic trees, etc. which are further converted into their current market value using current prices.</td>
<td>Continuous</td>
</tr>
<tr>
<td>Bid</td>
<td>Start prices presented to the respondents Ranging from 200, 400, 600, 800 to 1000 Naira</td>
<td>Categorical</td>
</tr>
<tr>
<td>WTPamount</td>
<td>The maximum amount the respondent is willing to pay into the scheme measured in Naira</td>
<td>Continuous</td>
</tr>
<tr>
<td>Age</td>
<td>The Age of the respondent at the last birthday (in years)</td>
<td>Continuous</td>
</tr>
<tr>
<td>HHnumber</td>
<td>Total number of household members living together usually as a nuclear family unit (Household size)</td>
<td>Discrete (count)</td>
</tr>
<tr>
<td>Sick</td>
<td>Indicating whether or not any household member fell ill in the past two weeks prior to interview 1 = sick and 0, otherwise</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>Enubias</td>
<td>Measure of enumerators’ bias 1 = Lead enumerator and 0, otherwise</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>WTP</td>
<td>Dichotomous variable indicating whether or not the individual accepts the offered Bid 1 = accept and 0, otherwise</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>Employed</td>
<td>Whether the respondent is employed or not both in the formal and</td>
<td>Dichotomous</td>
</tr>
</tbody>
</table>

\(^2^8\) These individuals include: (1) those whose probability for all the offered prices/bids are the same irrespective of how high it is, (2) Individuals who provide inconsistent probabilities for the offered bid on the card.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Measurement Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td>Indicating whether or not the respondent or any household member has participated in any health insurance scheme before or are currently enrolled in one</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>Hstate</td>
<td>The general state of health of the respondent at the time of interview</td>
<td>Categorical</td>
</tr>
<tr>
<td>Meanstreat</td>
<td>The general and often ‘usual’ means of seeking treatment when any member of the household falls ill</td>
<td>Dichotomous</td>
</tr>
<tr>
<td>QHcentre</td>
<td>The general rating of the quality of the health centres nearest to the respondent</td>
<td>Categorical</td>
</tr>
<tr>
<td>Dwelling</td>
<td>Nature of dwelling defined by the building and construction materials used</td>
<td>Categorical</td>
</tr>
<tr>
<td>Trust</td>
<td>Indicating the level of confidence in any community trust fund or where funds are pooled together and managed by the community</td>
<td>Categorical</td>
</tr>
<tr>
<td>Treatamount</td>
<td>Amount spent on treatment of any household member during the past four weeks. This includes the quantifiable indirect and direct costs measured in Naira.</td>
<td>Continuous</td>
</tr>
<tr>
<td>Borrowedamount</td>
<td>Amount borrowed for the treatment of any household member during the past four weeks where any household member has fallen sick. This also includes the monetary worth (measured in Naira) of sold items.</td>
<td>Continuous</td>
</tr>
<tr>
<td>Distance</td>
<td>The distance from the household to the nearest health centre measured to the nearest Kilometres.</td>
<td>Continuous</td>
</tr>
</tbody>
</table>

In Table 5 and Table 6, we provide the summary describing the sample population. In terms of household characteristics, the average and median household size is 6 members living in an average of 4 rooms where over 95% of these households have bathrooms, and only about 46% with toilet facilities in their houses. Most of the household heads interviewed (99%) are employed either in the formal sector by the Local Government Authority (though, mainly menial labourers and clerks) or the informal sector as craftsmen, petty-traders or farmers. Most of the respondents were engaged in one form of farming or the other either as a form of supplement or as a full time occupation thus limiting the direct observation of income variable hence a proxy measure was adopted as suggested by Fonta (2006). Adopting the wealth measure as the proxy for household income, the average household income was obtained as N121,714.20 (US$936.26) per annum or N10,142.85 per month. The gender distribution of the respondents was such that 63% were males with only 37% of female household heads, which is typical of most African household settings. Most of the households headed by females are as a result of being a widow. The average and median age of

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29 See the methodology section for a brief description of how the income variable (wealth measure) was obtained. Other methods that can be used as have been used in some empirical studies is the use of asset indices.

30 As at the time of survey, the exchange rate stood at US$1 ≅ N130.
household head that participated in the survey is about 52 years and 51 years respectively with the least age of interviewed respondent being 18 years and the maximum of 99 years\textsuperscript{31}.

In Table 6, literacy level of the respondents is low with over 77\% of the respondents having not had more than 7 years of formal education, which also characterizes the rural population in Nigeria. In terms of confidence in any community trust fund where funds are pooled together and managed by the community, about 78\% of the respondents had confidence in such schemes, which gives a high indication of credibility of establishing such a scheme.

Health characteristics of the sample of respondents shows that about 40\% of the respondents have had a household member falling sick within the last two weeks prior to the interview. The cost of treatment of these sick household members is as high as an average of ₦763 (\$5.87) across the whole sample of respondents. The amount borrowed for treatment including money got from the sale of valuable assets and property averaged across the entire respondents is about ₦666, which makes up over 87\% of the amount spent on treatment averaged across the total respondents, which is indicative of the huge financial burden created by ill health and the poverty implications of health care payments. In terms of the health status of the household heads, over half (60.2\%) of the household heads reported having health status above ‘Good’ as at the time of interview. Similarly, slightly over half (55\%) of the respondents seek health care from orthodox\textsuperscript{32} health care providers while 45\% patronize herbalists, traditional healers and most especially patent medicine stores as has been identified by Brieger (2002) and Ogunbekun et al. (1999). Some of the respondents that claimed to visit the formal providers do so mainly as a result of complications and further deterioration of health state and to the perceived quality of care at these health centres. The median and average distance from these households to the nearest health centre is about 3Km and 3.3 Km respectively with the maximum of about 10Km. Even though these household members have to access health care from a distance, more than half (59\%) of these respondents adjudged the quality of the health care centres nearest to them as above ‘Good’.

\textbf{Table 5: Summary Statistics of the variables elicited}

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev.</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>0.63</td>
<td>1</td>
<td>0.48</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Knowinsurance</td>
<td>0.11</td>
<td>0</td>
<td>0.31</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Floormaterial</td>
<td>0.82</td>
<td>1</td>
<td>0.39</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Toilet</td>
<td>0.46</td>
<td>0</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bathroom</td>
<td>0.96</td>
<td>1</td>
<td>0.19</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

\textsuperscript{31} The use of 99 years was the upper bound of the age vector. This implies that the respondent may be above 99 years.

\textsuperscript{32} Orthodox providers are categorized as clinics, maternity centres, dispensary, and hospitals. The unorthodox providers are categorized as patent medicine stores, traditional healers and herbalists, etc.
The knowledge of health insurance or any other form of insurance is quite low among the sample of respondents and this will not be any different from the general population of the rural dwellers as only about 11% of the respondents claimed knowledge of what insurance is all about. These respondents are mainly those who live close to the urban town of Nsukka. Similarly, only 3% of the respondents claimed to have participated in any form of insurance (not necessarily health related) in the past or at present.

**Table 6: Proportions of categorical variables used in analysis**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Proportion (%)</th>
<th>Cumulative proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educ</td>
<td>0</td>
<td>42.72</td>
<td>42.72</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>34.30</td>
<td>77.02</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>14.56</td>
<td>91.58</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>8.41</td>
<td>100</td>
</tr>
<tr>
<td>Hstate</td>
<td>1</td>
<td>6.80</td>
<td>6.80</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>33.01</td>
<td>39.81</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>46.60</td>
<td>86.41</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>13.59</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0.00</td>
<td>100</td>
</tr>
<tr>
<td>Qhcentre</td>
<td>1</td>
<td>4.21</td>
<td>4.21</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>36.57</td>
<td>40.78</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>46.60</td>
<td>87.38</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>12.62</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0.00</td>
<td>100</td>
</tr>
<tr>
<td>Trust</td>
<td>1</td>
<td>3.56</td>
<td>3.56</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>18.45</td>
<td>22.01</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>43.69</td>
<td>65.70</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>34.30</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 3 presents the distribution of the bid amounts. The number of respondents decline with increasing bid amount, which is typical of any ‘normal’ good with an inverse demand function.
In Table 7, the distribution and characterization of the responses is presented. Protest responses for the DCM are identified as the group of respondents who protested to contributing (either in cash or in kind) to support the proposed scheme. Generally, this group of Protest responses are further divided into two – The protest zeros and the true or genuine zeros. Protest zeros are respondents who protested against making payment to support the scheme and are therefore not willing to pay while true zeros are those who place zero value on the scheme because they cannot genuinely afford payment in cash or in kind and outliers are respondents who (1) accepts the initial bid offered and give as the maximum amount they are willing to pay at least 10% lower than the offered bid; (2) accepts the initial bid and offers to pay an amount greater than 10% of income measure (this is to guard against catastrophic health care payments). Valid responses\(^{33}\) for the use of cash, commodities and the SPC design were 62%, 65% and 70% of the sample of respondents respectively. The invalid responses for the use of cash, commodities and the SPC design are 19.5%, 16.6% and 10.3% respectively. Those categorized as refusals are those who did not provide answers to the valuation questions and those who could not be interviewed by the enumerators and they account for 18.7% in both the use of cash and commodities and 19.4% in the SPC design.

<table>
<thead>
<tr>
<th>Category</th>
<th>Cash</th>
<th></th>
<th>Commodities</th>
<th></th>
<th>SPC Design</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBS</td>
<td>%</td>
<td>OBS</td>
<td>%</td>
<td>OBS</td>
<td>%</td>
</tr>
<tr>
<td>Valid responses</td>
<td>235</td>
<td>61.8</td>
<td>246</td>
<td>64.7</td>
<td>267</td>
<td>70.3</td>
</tr>
<tr>
<td>Protest zeros</td>
<td>30</td>
<td>7.9</td>
<td>63</td>
<td>16.6</td>
<td>39(^N)</td>
<td>10.3</td>
</tr>
<tr>
<td>Outliers</td>
<td>44</td>
<td>11.6</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Refusal</td>
<td>71</td>
<td>18.7</td>
<td>71</td>
<td>18.7</td>
<td>74</td>
<td>19.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>380</td>
<td>100.0</td>
<td>380</td>
<td>100.0</td>
<td>380</td>
<td>100.0</td>
</tr>
</tbody>
</table>

An attempt made to reduce this was the use of call-back cards for these households especially those that were not available for interview. Also obeying the principle of freedom of the respondents could not make the enumerators persuade the respondents who refused to

\(^{33}\) The reader may note that valid and invalid responses are synonymous to non-protesters and protesters respectively.

\(^{35}\) Of the 39 respondents categorized as invalids, 12 provided probability of 100% for all bid amounts, 8 provided 75% for all bid amounts, 1 provided 50% for all the bid amounts, 10 provided 25% for all the bid amounts, 3 provided 0% for all the bid amounts, while 5 provided inconsistent responses.
provide answers to the valuation questions. However to reduce this, where the respondent is not cleared about the scenario, a repeat of the scenario was done to ensure that the response provided by the respondent corresponds to the true WTP. The analysis will, therefore, dwell on the category of the valid responses and the protest votes (outliers and protest zeros), and statistical justification will be provided for excluding the protest votes from the analysis and estimation of the mean/median WTP.

As a preliminary test for the presence of sample selection bias, a simple comparison of the difference in the means of the covariates of the two groups is performed and observed difference in some of the variables suggests the need for further statistical modelling using sample selection models as discussed by Heckman (1979) and Strazzera et al. (2003a) to formally detect the presence of and if necessary, correct for the differences in the two groups for the estimation of the mean/median WTP.

Covariates of rural households’ decision to prepay

In Table 8, we present the results for the selection or participation equation specified as a probit equation of participation on various household covariates. These factors are those that influence the probability of the respondent in reporting a positive WTP. These factors which influence the possibility of reporting a positive WTP does not necessarily tell us the amount the respondents are WTP but are used as a means of understanding the self-selection bias induced by differences in responses to the WTP question posed to the respondent (McClelland et al., 1993). They also represent the factors that influence the probability of participating or protesting. Among these factors for the use of cash are gender, recent experience of sickness, nature of the floor material of the household, distance to the nearest health facility, wealth or income and the initial bid amount.

Table 8: Selection equations using the Heckman’s 2-step and the Maximum Likelihood Estimation procedures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cash 2-Step Probit</th>
<th>Cash FIML</th>
<th>Commodity 2-Step Probit</th>
<th>Commodity FIML</th>
<th>SPC Mean Eqn 2-Step Probit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.005</td>
<td>1.367</td>
<td>2.123</td>
<td>1.341</td>
<td>-</td>
</tr>
<tr>
<td>Male</td>
<td>0.865</td>
<td>0.182***</td>
<td>0.802</td>
<td>0.183***</td>
<td>0.432</td>
</tr>
<tr>
<td>Sick</td>
<td>1.127</td>
<td>0.696</td>
<td>1.099</td>
<td>0.683</td>
<td>-</td>
</tr>
<tr>
<td>Floor</td>
<td>0.605</td>
<td>0.225***</td>
<td>0.610</td>
<td>0.234***</td>
<td>0.673</td>
</tr>
<tr>
<td>LTreatamount</td>
<td>0.139</td>
<td>0.103</td>
<td>0.143</td>
<td>-</td>
<td>0.209***</td>
</tr>
<tr>
<td>LDistance</td>
<td>0.440</td>
<td>0.135***</td>
<td>0.437</td>
<td>0.134***</td>
<td>-</td>
</tr>
<tr>
<td>Lwealthmeasure</td>
<td>0.327</td>
<td>0.099***</td>
<td>0.312</td>
<td>0.100***</td>
<td>0.882</td>
</tr>
<tr>
<td>LBid</td>
<td>1.018</td>
<td>0.186***</td>
<td>1.042</td>
<td>0.183***</td>
<td>0.278</td>
</tr>
<tr>
<td>Hhnumber</td>
<td>0.059</td>
<td>0.033*</td>
<td></td>
<td></td>
<td>0.059</td>
</tr>
<tr>
<td>Knowinsurance</td>
<td>-</td>
<td></td>
<td>0.262*</td>
<td>0.524</td>
<td>0.060</td>
</tr>
<tr>
<td>Lborrowedamount</td>
<td>0.060</td>
<td>0.039</td>
<td></td>
<td></td>
<td>0.060</td>
</tr>
</tbody>
</table>
Lnumrooms         0.420  0.196  -   0.067  
Toilet           -   0.103  0.251”  
Bathroom        0.556  1.287  0.483””  
% correctly predicted  81%  79%  81%  88%  
, ”, ”” Significant at 10%, 5% and 1% levels respectively.

For the use of commodities, factors that predict probability of participation include: recent experience of sickness, distance to the nearest health centre, household size, knowledge of health insurance, and the number of dwelling rooms in the household. Similarly for the SPC mean equation, we have recent experience of sickness, distance to the nearest health facility, wealth or income level of the respondent, ownership of bathroom and a modern toilet facility. As a measure of model selection and predictive power, we employed the percentage of correctly predicted probabilities as discussed in Wooldridge (2002). These percentages as presented in Table 8 shows a high level of prediction especially for the SPC design.

In Table 9, we present the results of the valuation or WTP equations for the use of cash and commodities as the payment vehicle, which are the results of the estimation of the WTP amount on the other covariates including the household socioeconomic, demographic and health characteristics which need not necessarily be the same as those used for the selection equation. From the presentation, columns (2) and (3); (8) and (9) report the result of the valuation equation where the least squares (OLS) estimator is used without correcting for selectivity bias as has been traditional used in empirical analysis. Columns (4) and (5); (10) and (11) show the results of the valuation equation using the 2-step procedure, which is analogous to using the least squares estimator but correcting for selectivity bias by introducing the IMR (Inverse of Mills’ Ratio) as a covariate. Columns (6) and (7) present the result of the estimation using the Maximum Likelihood Estimator (MLE) for cash as the payment vehicle. The test for sample selection bias will involve an inspection of the significance of the variable $\lambda$ (Lambda) obtained from using the Heckman’s 2-step approach. Given the significance of the variable ($\lambda = 0.356$) for the use of cash, a sample selection problem is rife. A further look at the adjusted R-squared ($R^2 = 0.016$) that was obtained from the auxiliary regression in Appendix III signifies the absence of collinearity between the regressors of both equations (participation and valuation) of the Heckman’s approach for the use of cash. Therefore, the FIML estimation may not necessarily provide any additional information. However, to further show that the FIML estimates will not be any much different from those obtained via the Hekit procedure, these results are presented as shown in Columns (6) and (7) of Table 9. This, therefore, implies that the results obtained from the least squares estimation on the valid responses will be biased and cannot, therefore be relied upon for empirical analysis and policy.

---

34 This form of testing is akin to the omitted variable test.
35 This is the conventional representation of the Heckman’s 2-step estimation procedure.
purposes. Turning to the results obtained from the Hekit procedure, it should be noted that the estimates of the mean and median that will be obtained thereof will be, however, biased upwards because of the positive sign on the variable \( r = 0.573 \) (see Eklof & Karlsson, 1999 and Strazzera et al., 2003a). For the use of commodities, there is no evidence of sample selection problem. This can be seen from the statistical insignificance of the variable \( \lambda \) (Lambda) obtained from using the Heckman’s 2-step approach (i.e. \( \lambda = 0.190 \) in Table 9).

Considering the variables in the equation (see Table 9), \( \text{LBid} \) is positive and statistically significant for the use of cash implying the presence of starting point bias\(^{36}\), though statistically insignificant for the use of commodities. This bias Mitchell & Carson (1989) explained to occur when the respondent’s WTP amount is influenced by the value introduced in the scenario and the respondent may regard the proposed amount as conveying an approximate value of the good’s true value hence anchor her stated amount on the start price. However, no specific method was used to compensate or adjust for starting point bias as Mitchell & Carson (1989) have also noted. Similar to the starting point bias is enumerator’s bias which is the bias induced by the enumerator (Smith et al., 1999b). It is assumed that this bias occurs when the enumerator’s questions are influential on the respondent and make them behave in a certain way thereby responding to the valuation question in a monotonous rather than a purely random fashion. The variable \( \text{Enubias} \) was however statistically insignificant and was omitted in the analysis suggesting the absence of enumerator’s bias for both the use of commodities and cash. This is however not surprising given the choice of experienced enumerators and the intensive training they underwent (see Smith et al., 1999b). Another very important variable that influenced the amount households are WTP is the proxy for income (\( \text{LWealthmeasure} \) and \( \text{Wealthmeasure3} \)) for the use of cash and commodities respectively, which are positive and statistically significant implying that richer households accept to pay higher amounts than poorer households. The economic intuition behind this suggests that income is a very important variable in determining the demand for any good and the direction of the sign shows the nature of the good as being normal. This finding with respect to income has been the debate and argument about the WTP approach in healthcare valuation as the amounts households or respondents are WTP is an increasing function of their ability to pay (ATP) (see Smith et al., 1999c:12)\(^{37}\).

Knowledge of health insurance is also another important variable that affects the amount households are WTP for the scheme. Households who know what health insurance is are willing to pay higher amounts because of the prepayment function, than those with no

\(^{36}\) This procedure of testing for sample selection bias is a modification of Thayer (1981). For a further investigation into the nature of this bias, see Mitchell & Carson (1989); Cummings et al. (1986).

\(^{37}\) See Smith et al. (1999c) for a detailed argument. They raised some potential reactions to this issue. (i) if the current income or wealth distribution is optimal, then those with greater command over resources should have greater influence on the way resources are allocated; (ii) if the distribution is sub-optimal, redistribution will not involve tampering with the results but rather by the use of direct redistribution measures of taxation and subsidy.
knowledge of health insurance as can be observed for the use of cash. Health status of the household head is also statistically significant and negative for the use of cash implying that households with poorer health status are willing to pay higher amounts for the establishment of the scheme in Nsukka than household heads with better reported health status. The reverse is, however the case for the use of commodities.

Table 9: Willingness to pay equations for the use of cash and commodities

<table>
<thead>
<tr>
<th>VALUATION OR OUTCOME EQUATION</th>
<th>Cash as payment vehicle</th>
<th></th>
<th></th>
<th></th>
<th>Commodities as payment vehicle</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>OLS 2-step</td>
<td>FIML</td>
<td>OLS 2-step</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>2.408</td>
<td>0.649</td>
<td>2.164</td>
<td>0.637**</td>
<td>2.243</td>
<td>0.635</td>
<td>4.323</td>
<td>0.543</td>
</tr>
<tr>
<td>Age</td>
<td>0.007</td>
<td>0.003**</td>
<td>0.006</td>
<td>0.003**</td>
<td>0.007</td>
<td>0.003**</td>
<td>0.010</td>
<td>0.010</td>
</tr>
<tr>
<td>Knowledge of insurance</td>
<td>0.377</td>
<td>0.125***</td>
<td>0.381</td>
<td>0.122***</td>
<td>0.380</td>
<td>0.122***</td>
<td>0.194</td>
<td>0.196</td>
</tr>
<tr>
<td>Health status</td>
<td>-</td>
<td>-</td>
<td>-0.055</td>
<td>-0.055**</td>
<td>-0.108</td>
<td>0.058**</td>
<td>-0.113</td>
<td>-0.113**</td>
</tr>
<tr>
<td>Floor</td>
<td>0.113</td>
<td>0.056**</td>
<td>0.100</td>
<td>0.108</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Distance</td>
<td>0.237</td>
<td>0.115**</td>
<td>0.261</td>
<td>0.244</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Toilet</td>
<td>0.362</td>
<td>0.084***</td>
<td>0.374</td>
<td>0.082***</td>
<td>0.363</td>
<td>0.082***</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wealth measure</td>
<td>0.147</td>
<td>0.049***</td>
<td>0.139</td>
<td>0.048***</td>
<td>0.142</td>
<td>0.048***</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>LBid</td>
<td>0.411</td>
<td>0.071***</td>
<td>0.441</td>
<td>0.070**</td>
<td>0.431</td>
<td>0.069</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Male</td>
<td>0.191</td>
<td>0.087**</td>
<td>0.191</td>
<td>0.085***</td>
<td>0.135</td>
<td>0.053***</td>
<td>0.182</td>
<td>0.061**</td>
</tr>
<tr>
<td>Trust</td>
<td>0.191</td>
<td>0.087**</td>
<td>0.191</td>
<td>0.085***</td>
<td>0.135</td>
<td>0.053***</td>
<td>0.182</td>
<td>0.061**</td>
</tr>
<tr>
<td>LDistance</td>
<td>0.226</td>
<td>0.085***</td>
<td>0.232</td>
<td>0.084***</td>
<td>0.182</td>
<td>0.061**</td>
<td>0.244</td>
<td>0.110***</td>
</tr>
<tr>
<td>Wealth measure3</td>
<td>0.275</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.356</td>
<td>0.146**</td>
<td>-0.277</td>
<td>0.190</td>
</tr>
<tr>
<td>l</td>
<td>0.573</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.573</td>
<td>0.454</td>
<td>0.176</td>
<td>0.306</td>
</tr>
<tr>
<td>r</td>
<td>0.621</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.621</td>
<td>0.610</td>
<td>0.621</td>
<td></td>
</tr>
<tr>
<td>Adj. R-Squared</td>
<td>-</td>
<td>0.275</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.275</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Log. Likelihood</td>
<td>-</td>
<td>-338.225</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-338.225</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*, **, *** Significant at 10%, 5% and 1% levels respectively.

The Age variable conveys an important interpretation in the Grossman (1972) and Kenkel (1994) sense of life cycle effect. The Age variable is negative and statistically significant for the use of cash implying that the elderly are less willing to pay higher amounts compared to the younger respondents and can be explained that the pay-off period for any human capital investment in health at older age yields lesser and lesser returns compared to younger ages, which Kenkel (1994) termed the effect due to life cycle. The results for the use of commodities however showed a positive relationship. Distance to be travelled to access the nearest health facility and confidence in the scheme are also major determinants of the amounts households are willing to pay as seen for the use of commodities. The male are also more willing to pay higher amounts than the female household heads and this shows gender bias in health care financing in rural Nigeria as also reported by Dong et al. (2003b). Other important variables are the ownership of a functional toilet facility and the nature of the floor materials.
### Table 10: Willingness to pay equations for the SPC design

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MEAN EQUATION</th>
<th>VARIANCE EQUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>2-step</td>
</tr>
<tr>
<td></td>
<td>Est. (2)</td>
<td>S. Error (3)</td>
</tr>
<tr>
<td>Constant</td>
<td>4.644</td>
<td>0.426**</td>
</tr>
<tr>
<td>Male</td>
<td>0.182</td>
<td>0.068***</td>
</tr>
<tr>
<td>HHnumber</td>
<td>0.020</td>
<td>0.011*</td>
</tr>
<tr>
<td>Education</td>
<td>0.130</td>
<td>0.036***</td>
</tr>
<tr>
<td>Floor</td>
<td>0.211</td>
<td>0.088**</td>
</tr>
<tr>
<td>LWealthmeasure</td>
<td>0.086</td>
<td>0.039**</td>
</tr>
<tr>
<td>Toilet</td>
<td>-0.238</td>
<td>0.068***</td>
</tr>
<tr>
<td>Trust</td>
<td>-0.081</td>
<td>0.040**</td>
</tr>
<tr>
<td>Numrooms</td>
<td>0.186</td>
<td>0.072***</td>
</tr>
<tr>
<td>/</td>
<td>-0.218</td>
<td>0.191</td>
</tr>
<tr>
<td>r</td>
<td>-0.404</td>
<td></td>
</tr>
<tr>
<td>s</td>
<td>0.539</td>
<td></td>
</tr>
<tr>
<td>Adj. R-Squared</td>
<td>0.143</td>
<td></td>
</tr>
</tbody>
</table>

* *, **, *** Significant at 10%, 5% and 1% levels respectively.
Table 10, we present the valuation results based on the SPC design. An application of the Heckman’s 2-step procedure for the mean equation showed the absence of sample selection bias. This is evidenced from the statistical insignificance of the $l = -0.22$. Therefore, we resorted to the OLS specification as suggested by Strazzera et al. (2003a). Columns (2) and (3) present the results of the OLS specification for the mean equation. Similarly, columns (6) and (7) present the results of the OLS for the variance equation. For the mean equation, the factors that determine the amounts households are WTP include gender of household head as households headed by males are more willing to pay higher amounts than those headed by female as also reported by Dong et al. (2003b), household size as this is an increasing function of amounts household are WTP, level of educational attainment of the head of household as the more educated heads are WTP higher amounts than the less educated heads which intuitively implies that those who are educated are knowledgeable about the importance of such schemes aimed at poverty alleviation. Another very important variable is the income of the household head. Amounts household heads are WTP is an increasing function of the income level as has been traditionally linked to the ability to pay principle. Similarly, households with better floor or house material are more willing to pay higher amounts which bear a strong relationship with the wealth of the household. For the variance function, the factors that determine variations in the WTP of households include gender signifying that there is less variability in the amounts male headed households are WTP as there is in the female headed households, ownership of a functional toilet facility, trust or confidence in the scheme, and the number of dwelling rooms in the household.

**Estimation of the willingness of rural households to pay for a community prepayment scheme**

Sequel to the estimation of the parameters for the various specification of the valuation equation, we obtain estimates of the mean and median quarterly WTP amounts for the proposed scheme in Nsukka as shown in Table 11. Row (1) shows estimates using the raw values for all the observations including the invalid observations (excluding refusals). Row (2) presents the estimates based on the least squares estimator using only the valid observations while rows (3) and (4), the estimates of the mean and median WTP for Heckman’s 2-step and the FIML approaches respectively. The confidence intervals for the estimates are also presented in Table 12.

| Table 11: Summary of estimated mean and median quarterly WTP amount (in Naira) |
|---------------------------------|-----------------|-----------------|-----------------|
|                                | OBS  | Median | mean  | OBS  | median | Mean  | OBS  | mean  |
| (1) All                        | 309  | 200.00 | 392.20| 309  | 550.00 | 788.09| 306  | 479.40|
| (2) OLS Valid (i.e. no selection) | 235  | 420.73 | 504.75| 246  | 826.96 | 1003.81| 267  | 547.37|
| (3) 2-Step                     | 235  | 378.24 | 458.67| 246  | 792.74 | 961.08| 267  | 573.08|
| (4) FIML                       | 235  | 387.22 | 466.68| 246  | -      | -     | -    | -     |

* Number of observations.

38 This is specified as $m_i = a_i + x^i$.
From row (1) in Table 11, the estimated mean and median WTP amounts for the use of cash are ₦392 and ₦200 per quarter respectively. For the use of commodities, the mean and median WTP are ₦788 and ₦550 per quarter respectively and the mean for the SPC design is ₦479. For the OLS on the valid responses specification, the median and mean WTP for the use of cash are ₦421 and ₦505 respectively, for the use of commodities, these amounts are quite appreciable as shown in Table 11. The mean and median WTP are respectively ₦1004 and ₦827. For the SPC design, the mean WTP is ₦547. Using the 2-step procedure, the mean and median WTP for the use of cash are ₦459 and ₦378 respectively. For the use of commodities, the amounts which are higher are ₦461 for the mean and ₦793 for the median. The SPC design produced a mean of ₦573. The FIML in row (4) shows that the mean and median WTP amounts per quarter are ₦459 and ₦553 respectively for the use of cash. For each of these specifications, the associated confidence intervals are also presented in Table 12.

### Table 12: Confidence intervals for the estimated mean and median WTP (in Naira)

<table>
<thead>
<tr>
<th></th>
<th>Cash</th>
<th>Commodities</th>
<th>SPC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CI median</td>
<td>CI mean</td>
<td>CI median</td>
</tr>
<tr>
<td>(1) All</td>
<td>200.0-400.0</td>
<td>337.0-447.5</td>
<td>488.4-700.0</td>
</tr>
<tr>
<td>(2) OLS Valid (i.e. no selection)</td>
<td>398.9-442.5</td>
<td>478.6-530.9</td>
<td>790.8-863.1</td>
</tr>
<tr>
<td>(3) 2-Step</td>
<td>358.2-398.3</td>
<td>434.3-483.0</td>
<td>755.3-830.2</td>
</tr>
<tr>
<td>(4) FIML</td>
<td>366.9-407.6</td>
<td>442.2-491.2</td>
<td>-</td>
</tr>
</tbody>
</table>

From Table 13, it becomes clear that the choice of model specification can significantly affect the estimates of the mean and median WTP amounts for welfare estimates and policy conclusions if care is not taken to address the problems that may arise due to, for example, the selected sample. For the use of cash, the absence of collinearity between the regressors in the two equations as presented in the auxiliary regression, coupled with the presence of sample selection problem as seen from the significance of lambda in the 2-step estimates makes it imperative to use the estimates produced from the 2-step procedure for policy purpose. Similarly, the general absence of sample selection problem in the commodities and the SPC analyses make it also imperative to use the estimates produced from the OLS estimation for policy purposes and aggregation. However, as noted by Smith et al. (1999c), the WTP values can only be used and applied to the specific circumstance for which it was elicited hence its use will be limited to the rural Nsukka community.

### Table 13: Comparison of WTP with the actual cost of treatment

<table>
<thead>
<tr>
<th></th>
<th>Cash</th>
<th>Commodities</th>
<th>SPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Per capita annual rural WTP</td>
<td>₦305.80</td>
<td>₦669.20</td>
<td>₦364.92</td>
</tr>
<tr>
<td>(2) Per capita annual rural health expenditure</td>
<td>₦1,027.67</td>
<td>₦1,027.67</td>
<td>₦1,027.67</td>
</tr>
<tr>
<td>(3) Per capita rural community annual WTP</td>
<td>₦65,991,640.00</td>
<td>₦144,413,360.00</td>
<td>₦78,749,736.00</td>
</tr>
<tr>
<td>(4) Per capita rural community annual health expenditure</td>
<td>₦221,770,754.40</td>
<td>₦221,770,754.40</td>
<td>₦221,770,754.40</td>
</tr>
<tr>
<td>% of WTP in annual health expenditure</td>
<td>29.76%</td>
<td>65.12%</td>
<td>35.51%</td>
</tr>
</tbody>
</table>
In Table 13, we present the results of the amounts households are WTP across the rural community of Nsukka under the assumption that 65% of the entire population is rural\(^\text{39}\). From the Table, comparing the per capita rural community annual WTP obtained as the quarterly mean WTP amounts transformed into per capital annual basis, with the per capita rural community annual health expenditure\(^\text{40}\) obtained from the 2004 National living Standard Survey across the relevant population (i.e. 65% of the population of Nsukka), it can be observed that using cash as the medium of payment, the amount available for the scheme will could only cover 30% of the annual cost of health care. The use of commodities provides an amount that covers over 65% of household annual health care expenditure in rural Nsukka. The Stochastic payment Card design produced better results of about 36% of the annual cost of health care when compared with the use of cash which only accounted for 30% of health expenditure. This implies therefore that the scheme will require additional funding in the form of subsidy from the government or donors to be able to cover for the actual cost of treatment. This therefore imply that the scheme though able to cater for some segment of the population, may exclude the poor except where payments are made in the form of agricultural commodities as is for the agrarian community considered or probably other forms that these households can afford.

Comparing the results obtained from the SPC design and the DCM employing the cash analysis, for similarity, it can be seen that the SPC design produced higher estimates than those of the use of cash (see Table 9 and Table 11). These higher estimates can be corroborated by the high level of confidence the respondents expressed in the establishment of the scheme to ameliorate the crunching effect of health care payment for the poor and rural dwellers. The SPC design which takes into account uncertainty as is usually the case in most economic decision processes and everyday life, therefore, provides valuable and insightful results for the use of the Stochastic Payment Card approach in eliciting the WTP of respondents for health care CVM studies. These results further imply that higher confidence which is associated with reduced uncertainty led to the higher estimates produced from the SPC design. Intuitively, therefore, lower estimates will be expected if the level of trust and confidence in such schemes is low. The use of cash did not take this explicitly into its analysis as it ignores the possibility of uncertainty and assumes that the respondent as a utility maximizer knows with certainty the exact amount she is WTP for the scheme. The SPC design which goes further to assume that the respondent has a valuation distribution opposed to a point estimate of the DC method therefore should be preferred judging from the empirical results provided in the research and the possibility that the respondent may not know with certainty, the exact maximum amount she will be WTP. Beyond the general consideration of uncertainty in terms of the respondents’ responses, health and health care is besieged with

\(^{39}\) This is 0.65 of the population of 332,000.

\(^{40}\) The median per capita annual health expenditure (₦1,027.67) from the NLSS (2004) was used to extrapolate to the relevant population.
uncertainty in terms of recovery from an illness or the outcome of a particular treatment option or therapy. If health and ill health are stochastic and not directly predictable, there is therefore a strong justification for health care CV studies to incorporate uncertainty in evaluation by the use of the SPC design or other similar uncertainty incorporating methods in eliciting preferences of individuals and respondents rather than the traditional DCM, the open-ended format or the ordinary payment card or bidding game technique as suggested by Smith et al. (1999b).

From the study, we found that the use of commodities as the payment vehicle gave a valuable insight to the importance of making context specific contributions to any form of community financing schemes aimed at poverty reduction, which need not necessarily be health insurance related as has been noted by Dave (1991), Toonen (1995) and Preker et al. (2001) and has proved to increase community participation through ownership and willingness to participate. Such context specific payments include resources that are locally generated within the population of interest such as the use of agricultural commodities in agrarian communities, the use of hand-craft materials and labour hours where these resources are more abundant. This from the findings of the research produced estimates which are about twice those obtained from the use of cash as the payment vehicle. Therefore, if any form of payment is to be used especially for the poor, even if it is at variant to those considered for the research, and it is specific to the community, it is most likely to generate acceptance and similar results may be obtained.

The use of commodities, therefore, proved to generate higher amounts than did the use of cash as the medium of payment. This being one of the first application of CVM to value the willingness of rural households to pay for community health insurance using commodities has therefore proven to be very helpful in at least addressing some of the problems inherent in the use of cash as the payment vehicle such as increasing the volume of resources available to the scheme, increasing community ownership and also increasing the participation rate. In most community based health insurance schemes (CBHIS), payments in-kind are rarely allowed (Atim 1998; Bennett et al., 1998; Musau 1999; Dave, 1991; Preker et al., 2001) and these authors have been sceptical about the possibility of generating adequate and sufficient resources to cover for treatment especially for the poor. Very few studies have shown cases where these schemes have been practised and have yielded some valuable results. The major gap is lack of empirical analysis employing any valid method of economic evaluation, such as that used in this research to ascertain the usefulness of this in raising additional resources and help protect the poor and vulnerable. Among some of the few studies investigating into the use of in-kind payments (farm produce or labour hours) that have been identified to increase the resource envelope and the membership base of the CBHIS that are not CVM studies include in Bolivia where rural prepayment schemes and plans allow membership dues in the form of contribution of seed potatoes to the community organisation, and membership base was greatly increased (Toonen, 1995). In this arrangement, at least a
family member has to work on the community lot for the production of potatoes. Proceeds from the sale of the potatoes are used for the purchase of drugs, pay for a bonus of an auxiliary nurse and also in renovating and refurbishing the health centres (Toonen, 1995).

In the Peso for Health community scheme in the Philippines, sick members who could not afford to pay the premiums charged were allowed to bring agricultural produce to the hospitals which are then monetized and used for the payment of health care services (Preker et al., 2001). In India, some schemes were identified where payment in-kind is acceptable for membership of the prepayment scheme but not as an on-going payment option and such schemes include the Raigarh Ambikapur Health Association (RAHA) Medical Insurance Scheme accepting rice, the Kasturba Hospital Scheme (SEWAGRAM) accepting sorghum, Goalpara Cooperative Health Society accepting community labour, etc. to ensure that the poor and vulnerable are not excluded (Dave, 1991). In the SEWAGRAM scheme, a CHW is employed for collecting the contribution usually during the harvest periods and then resells these items in the open market. The funds generated are then used to purchase drugs and pay SEWAGRAM for the mobile support and the difference is retained as the salary of the CHW (Dave, 1991).

Conclusion

Community based health financing schemes (CBHFS) are seen as the “mechanism for mobilizing community resources to share in the financing of local health services” (Cripps et al., 2000:3). These schemes are further designed to achieve the objectives of improving access to health care for the community they serve, improving quality of care, increasing efficiency in the use and allocation of scarce resources, and equity in health services (Cripps et al., 2000) especially for the poor and rural population. These schemes where they have been effectively established and managed can also help in increasing community ownership while ensuring equity in access to health care services.

The study, recognizing the efforts so far put in place by the government of Nigeria in ensuring that the population has access to affordable health care, provides complementary actions and where possible, efforts that can help accelerate the targets set by the government especially in its policy document – the National Economic Empowerment and Development Strategy (NEEDS) document. In the area of equity in finance and access, the general principles of equity imply that public policy be designed in such a way as to offer the greatest protection to the most ‘socially vulnerable’ while also providing equal protection to those in need from the adverse effects of health care payments especially during ill-health but this has not been the case under the current health care financing arrangements in Nigeria which presents a situation where little protection has been offered the poor and particularly vulnerable population and hence are often excluded from health care utilization at the time of need (Ichoku, 2005). This predominant form of health care payments reranks and further
impoverishes the non-poor households and also deepens poor households into poverty (Ichoku, 2005).

The findings from the research show that women, the educationally disadvantaged, and the poor are the disadvantaged group in health financing in the country as these groups were willing to pay lesser amounts as premiums than their other counterparts. With regards to policy, therefore, the institution of such pre-payment scheme or any other form of community health insurance scheme should achieve selective targeting by targeting the groups which have been identified as the vulnerable within the communities due to their inability of financing health care payments.

A sliding scale of premiums may be adopted such that premiums can be adjusted for income or any desirable factor so as to reduce inequalities in enrolment rates and access to health services. The premiums to be charged these local community members should be anchored on the reported measures of central tendencies such that the payment will not be catastrophic in nature and will not lead to further impoverishment of these households and jeopardize their consumption of other basic goods and services. Therefore, from a policy perspective, any premium amount set in excess of about \( \pm 5.5\% \) threshold\(^{41}\) of the reported mean and median will be considered as catastrophic to these households and is likely to further impoverish them.

The government can ensure the use of payment methods/medium that can eliminate the constraint implied by income in accessing health care including also, where possible, varied forms of payment. If varied forms of payment are allowed, households can choose to make contributions in whatever form of payment they could afford and this will further increase the enrolment rate as well as increasing the resource envelope of the scheme and further increase household’s access to health care services especially at the time of need.

To further incorporate the most vulnerable groups identified into such schemes, where possible, subsidy can be used as a buffer since most of these schemes suffer from a low resource mobilization base (see also Arhin-Tekorang, 2001; Jütting, 2003). This subsidy is in the form of augmenting for the differences between the amount available to the scheme and the actual cost of treatment as was shown in Table 13. Such subsidies may not only be limited to the government alone. Similarly, as the pre-payment scheme is designed to be self-financed (i.e. through household’s contribution), there is expected to be marked inequities in the distribution of resources as richer communities will be able to pay higher amounts as premiums than poorer communities hence government/fiscal transfers should implicitly build this into its framework to possibly also, offset any observed inequities that are likely to arise if the socioeconomic status of these communities vary markedly.

\(^{41}\) This threshold was obtained from the reported confidence interval reported in Table 12.
There is also a need for renewed and increased commitment of the government of Nigeria to increasing funding and allocations to the health sector in general especially with the observed general decline. With increased government commitment to the health sector, infrastructural decay will be averted and some of the impending inequity issues addressed. To this end, the government can also make these schemes to be further integrated into microfinance schemes such as is the case in India and Bangladesh with the SEWA and the Grameen banks respectively (see Jütting, 2003).

Part of the problems faced by the poor and the rural population is the problem of access to information hence the low knowledge of health practises and health insurance among these population. As a plausible recommendation, health education, adult literacy and public enlightenment campaigns may be intensified, such that the observed information lacunae can be bridged. Households, especially the poor are often not able to invest in health because they are not aware of the benefits to be derived thereof even though they might be constrained by their socioeconomic status. Similarly, where possible, health promotion should be encouraged to promote demand for preventive health services, which are usually cheaper than curative care even in the long-run so as to reduce the incidence of most preventable diseases and loss of welfare.

From the over 75% confidence and trust expressed in the proposed scheme by households in terms of their willingness to participate, the likelihood of establishing and extending such schemes to other rural population within the country is high even though there is need to battle with issues surrounding the level of resources to be mobilized, the small size of the risk pool, limited management capacity and isolation from a more comprehensive benefits (see for example Jütting, 2003; McIntyre et al., 2005; Arhin-Tekorang, 2001) etc. Following this, a broader and more encompassing policy for these community financing schemes, therefore, is integrating them into the formal NHIS, such that resource constraints for the scheme may at least be minimized through a larger risk pool; cross subsidization; the possibility of external financial support or augmentation, which will include government subsidies, donor funding, reinsurance to enlarge the effective size of small risk pools and access to a broader benefit package.

Technical support in managing and running such schemes can be provided by the government and where possible, train the local population to carry out some basic procedures such as the community health workers (CHWs). This can be used to strengthen the capacity of these local schemes. Such support and training can also be extended to communities wishing to establish such schemes. Government should therefore ensure that an umbrella body or organisation is instituted which comprises the government and representatives of these schemes which aims at reshaping, monitoring, reforming and where possible, regulating the operations of the schemes especially when these schemes are to be reproduced in various parts of the country as has been practised in countries like Philippines.
The eventual success and development of these schemes as noted by Bennett et al. (1998) will depend largely on the continuous adaptation of the schemes to evolving circumstances and lessons and also its design features. The schemes’ design must be given detailed and careful thought by the government as this is likely to affect the nature and the outcome of the schemes. This design which need not be rigid should be made flexible to adapt to evolving circumstances such as the issue of the use of sliding scale premiums, benefit package composition and context specific payments especially as it related to the rural poor.

Methodologically, the use of the stochastic payment card design shows the importance of uncertainty in economic valuation and analysis. We are therefore advocating for the use of such elicitation formats when policy decisions are to be based on the results of the CVM study rather than the ordinary payment card design as proposed by Smith et al. (1999b).
References


Appendix

Appendix I: Sample of the dichotomous choice design

Considering the importance of the scheme mentioned, will your household be willing to pay ___ Naira quarterly to obtain the prescribed minimum benefits of the scheme? (Yes/No)

What is the most your household can afford quarterly for the scheme? ______

Start Prices will be: (200, 400, 600, 800, and 1,000) Naira.

If no WTP amount is reported, why will your household not be WTP for the scheme?
   i) The programme has no value to my household
   ii) We cannot afford to pay
   iii) Government should pay for such a programme
   iv) Other members of the society should pay
   v) Out-of-pocket payment is better
   vi) I am not clear about the proposed programme
   vii) I am not comfortable with this particular question
   viii) Other (specify)

If there is an option of paying in kind (commodities), will your household contribute? (Yes/No)

If yes, what quantity of yam, rice, beans, cassava, etc can your household afford quarterly? ______

Appendix II: Sample of the Stochastic Payment Card Design

Now consider your monthly income and your expenditure before you vote for a particular price. If the price you are going to choose will re-arrange your expenditure pattern, probably by increasing it, how probable are you to pay each of the following prices quarterly in order to obtain the benefits of the scheme in the community?

<table>
<thead>
<tr>
<th>Quarterly cost to the household in</th>
<th>Definitely</th>
<th>Probably</th>
<th>Not sure</th>
<th>Probably</th>
<th>Definitely</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0%</td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>200</td>
<td>0%</td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>400</td>
<td>0%</td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>600</td>
<td>0%</td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>800</td>
<td>0%</td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>1000</td>
<td>0%</td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Appendix III: Auxiliary OLS regression testing for collinearity

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Est.</th>
<th>S. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary Regression by OLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.687</td>
<td>0.291</td>
</tr>
<tr>
<td>Age</td>
<td>-0.002</td>
<td>0.002</td>
</tr>
<tr>
<td>Knowinsurance</td>
<td>-0.012</td>
<td>0.025</td>
</tr>
<tr>
<td>Hstate</td>
<td>-0.035</td>
<td>0.052</td>
</tr>
<tr>
<td>Floor</td>
<td>0.066</td>
<td>0.038</td>
</tr>
<tr>
<td>Toilet</td>
<td>-0.033</td>
<td>0.022</td>
</tr>
<tr>
<td>LWelthmeasure</td>
<td>0.023</td>
<td>0.032</td>
</tr>
<tr>
<td>LBld</td>
<td>-0.083</td>
<td>0.290</td>
</tr>
<tr>
<td>Adj. R-Squared</td>
<td>0.016</td>
<td></td>
</tr>
</tbody>
</table>

42 The full questionnaire is available from the authors on request.
43 Such respondents are re-explained the scheme again in order for them to fully understand the scheme before providing answers.