Households' Willingness to Pay for Health Microinsurance and its Impact on Actual Take-up: Results from a Field Experiment in Senegal

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1. Introduction

Health shocks in developing countries can lead to large unexpected expenditures which must often be funded by out-of-pocket (OOP) payments. They constitute the most important mechanism for financing healthcare expenditure in several developing countries (ILO, 2008; WHO, 2011), but are also 'the least equitable form of health funding' (WHO, 2010, page 42) due to their regressive nature. It has been shown that the cost of major illness may lead to impoverishment (see, among others, Wagstaff [2007] and Wagstaff and van Doorslaer [2003]). This is particularly the case for the most vulnerable categories in society; workers in the informal sector and rural areas are less likely to be involved in mandatory social security schemes, as is often the case for public servants and workers in the formal private sector (see Acharya et al. [2013] and Ekman [2004] for reviews).

The last two decades have seen stagnating, if not decreasing, budgetary support for health care services in many developing countries; this has led to the prevalence of poor quality public health services (WHO, 2010). According to the world development indicators from the World Bank, public health funding in Senegal has been stable over recent years, while overall per capita health expenditures have been increasing in the same period (World Bank, 2013). The decreasing ability of the state to meet health care needs makes it unable to provide universal insurance for its population. This has led to the emergence of many community-based health insurance schemes (CBHIS) in Senegal. At the same time the market has been ineffective in providing health insurance to low-income people, even in urban environments. Private insurers are often faced with important adverse selection problems and high transaction costs. As a consequence, the costs of their contracts are often prohibitively high. Poor

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people must therefore resort to informal ways to insure themselves (Dercon, 2002; Morduch, 1995, 1999), or health insurance schemes rooted in local organisations (Jutting, 2003). CBHIS are now at the core of health protection and universal coverage strategies and policies in many African countries (Diop, Sulzbach, & Chankova, 2006). In Senegal, they are locally known as '*mutuelles de santé*' or mutual health organisations (MHOs). MHOs are a form of insurance that allows members to pay monthly affordable premiums to reduce health care payments at the point of service. They are not-for-profit grass roots organisations, based on voluntary participation and underpinned by concepts of mutual aid and social solidarity. Several studies show that participation in MHOs helps to mitigate OOP expenditures, generates an increase in modern healthcare utilisation and leads to improvements in health outcomes (Ekman, 2004; Jutting, 2003; Wang, Yip, Zhang, & Hsiao, 2009).

Several papers have estimated the WTP for CBHIS and its socio-economic determinants in different developing countries (Donfouet, Makaudze, Mahieu, & Malin, 2011, Dong, Kouyate, Cairns, Mugisha, & Sauerborn, 2003; Dong, Kouyate, Cairns, & Sauerborn, 2005; Dror, Radermacher, & Koren, 2006; Onwujekwe et al., 2010; Wang et al., 2009). Such valuations can help both policy-makers and existing MHOs in better understanding the characteristics of the demand for health microinsurance products. This article considers the role of individual and household socio-economic determinants of willingness to pay for MHOs' premiums. It contributes to the existing literature by providing evidence on the role of income, wealth and risk preferences on WTP. Conscious of the potential limits of our elicitation strategy, we incorporate the existing literature on the effects of preference anomalies (Watson & Ryan, 2007).

An additional and important contribution of our article to the literature comes from the fact that we can assess the role of WTP in predicting the effective take-up of MHO's products. The main approach to validation is either through laboratory experiments or field surveys that compare hypothetical WTP with actual WTP for the same good. Results on the assessment of criterion validity in the health sector are scarce and have been mixed. Several attempts with laboratory experiments have shown that contingent valuation approaches tend to overestimate real WTP (Blumenschien, Johannesson, Blomquist, Liljas, & O'Conor,. 1998; Cummings, Harrison, & Rutstrom, 1995; Harrison & Rutström, 2008; Johannesson, Liljas, & Johansson, 1998). However, such laboratory experiments have the potential limits of considering relatively cheap private goods and are carried out under artificial conditions, in most cases involving students.

Based on field experiments, Blumenschein, Johannesson, Yokoyama, and Freeman (2002) show that no differences arise between hypothetical 'definitely sure' yes responses and real yes responses in the decision to purchase an asthma management programme. Similar results are found in Ryan, Sutthi, and Cairns (2007), where a discrepancy arises between hypothetical stated and real responses in a field experiment proposing a prepaid dental care plan in Thailand. However, after calibrating data using qualitative and certainty scales, any such differences turn out to be insignificant. Bhatia and Fox-Rushby (2003) found no discrepancy at the aggregate level between hypothetical WTP elicited through a bidding game method and actual demand for treated mosquito nets in Gujarat, India. Conversely, Onwujekwe, Hanson and Fox-Rushby (2005) detect relevant divergences between three contingent valuation methods (bidding game, among others) and actual WTP for insecticide-treated bed nets in Nigeria and analyse the causes of such divergences. Ashraf, Berry, and Shapiro (2010) find a positive impact of WTP on actual purchases of drinking-water disinfectant. To the best of our knowledge our work represents a first attempt at evaluating the predictive power of WTP on the actual take-up of health microinsurance products. In order to do so, after having measured WTP, we offer the opportunity to join an MHO to 360 randomly selected households in the city of Thies, Senegal. This is done according to a randomised field experiment described in detail below.

The article proceeds as follows. Section 2 discusses the study area, study design, sampling issues, data collection approach, our theoretical framework and methods of data analysis. Section 3 shows the results on the impact of different controls on WTP and also the impact WTP has on the actual uptake of MHO. Section 4 discusses the results, before Section 5 concludes.

2. Methods

2.1 Study Area and Design

We developed a partnership with *Groupe recherche d'appui aux initiatives mutualistes* (GRAIM), a Senegalese NGO promoting the work of local MHOs active in greater Thiès, in early 2010. Thiès was chosen for two main reasons. Firstly, it is one of the largest cities in Senegal, with a population of about 240,000 inhabitants. Secondly, some of the local MHOs are the oldest in Senegal, having been active for 15 years; as such the city possesses a well-established supply of MHOs.

During the spring of 2010 we hired a team of 10 enumerators who were in charge of administering the questionnaire and collecting the information. Our baseline survey aimed to obtain information on each household member's religion, level of education and health problems (sickness and chronic diseases). We also gathered information from the head of household concerning work, monthly income and a number of other factors, which we describe below in greater detail. In the context of the households we surveyed, and this can safely be extended to the broader national level, the husband is generally considered to be the breadwinner and the head of the house. As such, he is expected to provide insurance for the members of his household. This should provide ample justification as to why we collected these key variables affecting health insurance intake from the head. In what follows, we therefore use data at the household level.

2.2 Sampling

We use data collected on 360 randomly selected households across the whole territory covered by the city authorities, which represents an area of approximately 20 km^2. We sampled the number of surveyed households across all 15 Thiès neighbourhoods according to their respective share of the overall population estimates (based on the 2002 census ANSD, 2006). An official map of the city was used to select a number of streets spread across each neighbourhood. Each street was assigned a number of households according to its length and density. For every street we used a pseudo-random process by which every fifth lot according to a specific direction was picked. Since many households live on the same lot in semi-detached rooms, enumerators randomly selected one room by lot, according to a clock-wise selection which varied from lot to lot. In the case where a lot was found empty or the head of household was not present, enumerators were instructed to set appointments and revisit the household later. Given the small number of households sampled from such a relatively large area, we argue that spillovers within the sample are unlikely.

2.3 Theoretical Framework

Our questionnaire included a module on WTP. To obtain the WTP of household heads we employed the contingent valuation method through an elicitation strategy called the 'bidding game'; this strategy has been used in other works aimed at eliciting WTP for MHOs (Dong et al., 2005; Dror et al., 2006; Onwujekwe et al., 2010). With this strategy, if the interviewee agrees upon the first bid, the interviewer increases the bid by a certain amount up to the point at which the respondent says 'no'. WTP is estimated to correspond to the last amount before the 'no'. If the respondent says 'no' to the first bid, the interviewer decreases the following bid and stops when the respondent says 'yes'. As such, WTP corresponds to the amount the individual agrees upon.

The advantage of the bidding game approach lies in the possibility of obtaining more precise and reliable estimates of WTP (Dong, Kouyate, Cairns, & Sauerborn, 2003). It has been shown to generate more efficient estimates than those based on a single question (Hanemann, Loomis & Kanninen, 1991), or based on an open-ended follow-up question (Haab & McConnell, 2002; Watson & Ryan, 2007). Moreover, such an approach is suggested in contexts where prices are variable (McNamee, Ternent, Gbangou, & Newlands, 2010), as is the case with MHOs.

We elicit WTP through a series $t = 1, 2, \ldots, T$ of questions proposing an amount A_t. The respondent answers 'yes' if $WTP_t \geq A_t$ and 'no' otherwise. By stating this, we assume that WTP does not change with follow-up questions; that is: $WTP_1 = WTP_2 = \ldots = WTP_T$. However, this assumption is violated

in case of a structural shift and anchoring problems due to incentive incompatibility and starting point bias.

According to the model introduced by Alberini, Kanninen, and Carson (1997), answers to follow-up questions may be untrue due to incentive incompatibility. In particular, true WTP, which we assume to correspond to the ones elicited at the first bid WTP_1, is shifted by a structural parameter δ:

$$WTP_{t>2} = WTP_1 + \delta \tag{1}$$

The sign of δ might lead to different possible explanations. In particular, a negative value of δ means that the respondent is less likely to accept the second bid, so that final WTP might be underestimated. A negative structural shift is consistent with theoretical and behavioural models such as prospect theory (DeShazo, 2002), incentive incompatibility (Carson & Groves, 2007) and 'guilt and indignation' (Bateman, Landford, Jones, & Kerr, 2001, page 195). A positive δ can be explained by yea-saying behaviour (Kanninen, 1995), which leads to upward-biased estimations.

Herriges and Shogren (1996) claim that WTP elicited with follow-up questions may suffer from an anchoring effect. In this case, respondents reveal a WTP that is the average of the starting bid and the true (initial) WTP. This is equal to:

$$WTP_{t>2} = (1-\gamma)WTP_1 + \gamma A_1 \tag{2}$$

with $0 \leq \gamma \leq 1$ For every given follow-up question A_t, the respondent accepts the bid if $(1-\gamma)WTP_1 + \gamma A_1 \geq A_t$. Consequently, in the presence of anchoring ($\gamma > 0$), after an initial yes response (that is: $A_t > A_1$), the likelihood of accepting the second bid decreases. This is due to the fact that the prior on WTP has changed due to the information provided by the initial bid. This results in underestimation of true WTP. Conversely, after an initial no response ($A_t < A_1$), anchoring leads to a higher probability of accepting the second bid, with consequent overestimation of WTP. The choice of initial bids is thus crucial in determining WTP over/underestimation. Finally, Whitehead (2002) integrates the two previous models, considering the case where structural shift and anchoring to the initial bid hold together.

2.4 Data Collection Approach

Through an interviewer-administered questionnaire, we proposed a hypothetical health insurance product covering 80 per cent of the cost of consultations at health posts and 50 per cent of expenses at hospitals or health centres to all heads of households surveyed.[1] Such contractual conditions are similar to those proposed by most MHOs present in the city, albeit with some slight variations.[2] We asked how much the household head would be willing to pay for a monthly per capita premium for such a product. Starting bids are randomly assigned[3] in order to mitigate the risk of starting point bias (Mitchell & Carson, 1989; Onwujekwe & Nwagbo, 2002). The amount of increments/decrements is 50 CFA francs (FCFA); no upper or lower limits to the possible bids were introduced. We adopted follow up questions with two degrees of certainty: 'definitely sure' and 'probably sure'. This approach has been shown to remove the hypothetical bias both in laboratory and field experiments (Blumenschein, Blomquist, Johannesson, Horn, & Freeman, 2008; Blumenschein, Johannesson, Blomquist, Liljas, & O'Conor, 1998; Blumenschein, Johannesson, Yokoyama, & Freeman, 2002; Johannesson et al., 1999). We limit our attention to 'definitely sure' answers. Out of our sample of 360 households, 36 were already a member of an MHO at the time of the survey and were consequently excluded from the sample. The following analysis is thus based on a sample of 324 households.

To evaluate the predictive power of WTP on the actual take-up of health microinsurance products, we offered these households the opportunity to join an MHO. Once insured by an MHO, members can directly access specified health facilities (health huts, posts and centres) and are required to pay just a fraction of the fees; the remainder is covered by the insurer. The range of interventions covered and the extent of the coverage varies from one MHO to the other. However they generally cover 25–75 per cent of consultation costs (at health huts, posts and centres) and 50–100 per cent of the cost of medical

exams, hospitalisations, and various inpatient care fees at health centres (the regional and St-Jean de Dieu hospitals). Members are expected to pay their premiums during a monthly visit to the finance officer.[4] The Online Appendix lists the rules MHOs impose upon new members.

This project was part of a larger investigation that aimed to study the impact of two treatments on the take-up of MHO membership. During our second visit to households after obtaining the WTP, we carried out a randomised controlled trial to test the impact of two different treatments. The first consisted of an insurance literacy module that communicated the benefits from health microinsurance and the functioning of MHOs to a randomly selected sample of households. Of the 324 households, 163 were invited to attend an insurance literacy module to be held on a non-working day in the city centre before our second treatment went ahead. Invitations were directly handed to the heads of household. The module consisted of a three-hour educational presentation on health microinsurance and specifically on the functioning of MHOs (including the differences across various active MHOs in the city of Thies). A lesson on personal financial management, exploring the notions of savings, risk and insurance, was also given. Case studies of different MHO member and non-member households were given to illustrate the different concepts introduced. Sessions were given to groups with a maximum of 20 individuals at a time. The comparison group of 161 households received nothing. This randomisation allows us to measure the causal impact of the effect of insurance literacy training on the purchase of insurance from MHOs. This way we can assess the module's impact while also screening out other effects such as each individual's inherent propensity to opt for insurance. Additional details on this treatment can be found in the Online Appendix.

After the insurance literacy training was completed, and independent of this assignment, the households were split into three randomly chosen sub-samples and each sub-sample received an additional marketing treatment in the form of one of three vouchers. Thus, of the 163 households invited to attend the insurance literacy module, 53 received voucher 1, 55 voucher 2 and 55 voucher 3 (a similar distribution applies for the 161 households who did not receive an invitation to the module). Voucher 2 offered a full refund of membership fees in an MHO. That represented an amount of 1,750 FCFA on average (membership fees for the MHO joined by voucher holders ranged from 1,000 to 3,000 FCFA). Voucher 3 provided a full refund of membership fees (equivalent to voucher 2) plus a refund of 250 FCFA a month per new member covering fees linked to the observation period of three months (a refund was made for each new member for up to 3,000 FCFA, which is the equivalent of three months' premium for four people at 250 FCFA/month). The refunds offered with voucher 2 and 3 were such that respondents did not have to pay cash up-front and then wait for a reimbursement. The vouchers actually reduced the initial cash outlay as these refunds were directly transferred to the MHO's treasuries. Voucher 1 had no monetary value attached; instead representing a simple invitation to the GRAIM in the event that the household was keen to know more about MHOs and the insurance products offered. The recipients had a period of two months to redeem the voucher by visiting the GRAIM and filling in an application form to join the MHO of their choice.[5]

Thus, in our analysis, a household subscribes by simply redeeming its voucher. We could not collect information on how long households remained members once they redeemed their voucher. Subscription is thus not measured in terms of for how long they remained enrolled. To ensure that our dependent variable was correctly constructed, we phoned all households who did not redeem their voucher one month after the redemption date to ask them whether, in the meantime, they had joined an MHO but not used their voucher. This allowed us to account for the membership of two additional households.

2.5 Data Analytical Methods

We estimate WTP, both in log and level terms, under the assumption of WTP distribution consistency across responses, meaning that respondents who have the same underlying WTP in mind react the same way to bids. This assumption implies perfect correlation and the absence of systematic errors across responses to different bids. This is a standard assumption in the literature that focuses on the determinants of WTP for health microinsurance (see, among others, Dong et al., 2003). This allows us

to employ the OLS estimator below as in McNamee et al. (2010). We first estimate a base model as follows:

$$WTP_i = \alpha + \beta A_{1i} + \boldsymbol{X}_i\gamma + \varepsilon_i \tag{3}$$

where WTP_i is the final elicited value of individual i, A_{1i} is the initial bid, X_i is a vector of individual and household characteristics and ε_i is an individual error term. The presence of a structural shift in WTP is estimated as follows:

$$WTP_i = \alpha + \beta_1 A_{1i} + \beta_2 D_i + \boldsymbol{X}_i\gamma + \varepsilon_i \tag{4}$$

where D is a dummy variable equal to 0 when the respondent answered only one follow-up question, meaning that they either accepted the first bid and refused the second, or rejected the first bid and accepted the second; D is equal to 1 otherwise. This variable allows us to identify whether structural differences exist among those responding to one or more follow-up questions. The anchoring effect in follow-up questions is accounted for by the interaction term of D multiplied by A_1. If anchoring is present, β_3 is expected to be significant. Finally, the shift and anchoring model allows for the possibility of two effects driving WTP:

$$WTP_i = \alpha + \beta_1 A_{1i} + \beta_2 D_i + \beta_3 D_i * A_{1i} + \boldsymbol{X}_i\gamma + \varepsilon_i \tag{5}$$

For the second part of our analysis, we evaluate the effect of elicited WTP on the effective purchase of health microinsurance products. We estimate the following model:

$$Y_i = \alpha + \beta_1 WTP_i + \boldsymbol{X}_i\gamma + \beta_2 E_i + \beta_3 Voucher_i + \varepsilon_i \tag{6}$$

where Y is a dummy variable equal to 1 if the head of household i has decided to subscribe the household to an MHO. The index i identifies households. $\boldsymbol{X}$ is a vector of covariates which contains: household heads' characteristics (gender, education, household income, employment status, if (s)he is impatient and strongly risk averse); size of the household; an indicator of household wealth; whether the household has already health insurance; a dummy if the household uses a saving device (rosca, bank, MFI); a proxy for the status of the household's health (using a dummy which takes value one if the household reported sickness during the last year); and the household's level of insurance literacy. E is a dummy variable that equals one if the household was invited to the insurance literacy module. *Voucher* is a dummy variable that equals one if the household was given either voucher 2 or 3 (we find similar results if we use two dummies for voucher 2 and 3 separately).

3. Results

3.1 Descriptive Statistics

Table 1 reports summary statistics for the socio-economic characteristics we consider in our study and which will be included in our specifications as controls (in the vector $\boldsymbol{X}$ of individual and household characteristics). The fourth column gives a description of each variable and the last column the expected sign of the a priori relationship with WTP.

Some dummy variables from Table 1 require additional description. The first is a variable which takes a value of 1 if the household head is strongly risk averse. That is, if (s)he always opted for the certain outcome when presented with a set of choices between gambles and certain gains using a similar methodology as Voors et al. (2012). The choice offered was between a certain gain of 200 FCFA or play with probability of 1/4 to win 1,000 FCFA and probability of 3/4 to win nothing (the choice was then offered for two other certain amounts: 250 and 300 FCFA compared with the same gamble). We also ran this exercise with the same amounts multiplied by a factor of 10. Before

Table 1. Summary statistics

	Mean	SD	Description	A priori relationship with WTP
Head is male	0.74	0.44	=1 if head is male; 0 otherwise	none
Head attended primary school	0.19	0.39	=1 if head has attended only primary school; 0 otherwise	positive
Head attended secondary school or more	0.45	0.50	=1 if head has attended high school or more (6 years of education or more); 0 otherwise	positive
Household size	6.77	3.25	Number of individuals member of a given household	positive
Number of children younger than 5 years	0.64	0.96	Number of children member of the household who are aged under 5	positive
Already insured	0.25	0.43	=1 if the head has already health insurance (private or IPM); 0 otherwise	negative
Knowledge of insurance principle	1.99	2.41	Number of correct answers to a series of 7 true or false questions on the nature of insurance; the more knowledgeable a household is of basic insurance principles, the higher our variable score is[a]	positive
Head is a public servant	0.19	0.39	=1 if head works for a public institution; 0 otherwise (the benchmark group is employed by private firms) Generally public servants have access to a more generous type of IPM (see section 3.1) than those employed by a private firm: this can negatively affect their demand for MHO insurance	negative
Head is self-employed	0.42	0.49	=1 if head is self-employed; 0 otherwise; wage earned in informal activities (petty retailing, craftsmen, transport and so forth) are likely to fluctuate more(the benchmark group is employed by private firms)	negative
Saving device	0.55	0.50	=1 if household uses one of three saving devices: ROSCAs, banks or microfinance institutions; 0 otherwise Having access to a saving device might help to buffer health shocks by alleviating credit constraints and may render MHOs less attractive; alternatively, it may help households to pay for membership fees and premiums and make MHOs membership more likely; also being a member of a ROSCA may imply some discipline in saving which could in turn help an individual in committing to an MHO's premiums	positive/ negative
Durables	6.53	3.20	Sum of a list of items owned by the household comprising among others home appliances and furniture, mobile phone and means of transportation[b]	positive

(*continued*)

Table 1. (*Continued*)

	Mean	SD	Description	A priori relationship with WTP
Household income, in 10000 FCFA	22.65	19.67	Monthly sum of all sources of monthly income (labour income or wage, rent and received transfers) across all members of the household[c]	positive
Reported sickness (last 12 months)	0.67	0.47	=1 if head reported one of their household members having been sick in the previous 12 months; 0 otherwise; more sickness is likely to lead to greater demand for health care and hence for health insurance	positive
Strongly risk averse	0.57	0.50	=1 if the household head is strongly risk averse; 0 otherwise	positive
Impatient	0.41	0.49	By using the multiple price list questions (see Voors et al., 2012) we elicit a discount factors; we then generated a binary variable: =1 if the head belongs to the more impatient half of our sample; 0 otherwise	negative
Final WTP (in FCFA)	304.4	299.3	Elicited value for WTP from the head of household (bidding game).	–
N	324			

Notes: All variables were constructed on the basis of the answers elicited through interviewer-administered questionnaires.

[a]These true or false questions are: Insurance premiums are not reimbursed if a client is not sick; Only in case of illness does the insurer make expenditures on my behalf; In case of sickness, I can consult a doctor at a cheaper rate than if I am uninsured (the insurer will pay a fraction of the costs); In case of death, an insuree's family will receive money from the insurer; A health insurer can help me repay my loans; If I am uninsured and get sick, I will have to assume all the medical expenditures; If insured, is there a maximum number of months after which the insurer has to make a cash transfer to the insuree?

[b]The full list of items is: fridge; color TV set; car; freezer; DVD player; sewing machine; gas cooker; stereo; bed (wood or metal); stove (camping stove); couch; clock; electric cooker; bicycle; gas lamp; oven; motorbike; petrol lamp; camera; charrette; electric fan.

[c]Due to the sensitivity of questions related to income, and the reticence to provide exact amounts, answers were, in most cases (68% of all answers), collected according to intervals. An aggregated measure of income was constructed at individual level by adding intervals' midpoint values for the ten income intervals or exact values when given to rents and transfers nominal values. We then categorized the answers into quintiles.

answering this set of six questions, each household head was informed that, after completion of the section, a lottery would be randomly picked out by the enumerator who, in accordance with the preference of the player, would either give the certain outcome or play the selected lottery for real money. We also elicited discount factors (Voors et al., 2012). Each household head had to choose, from a list of different amounts to be received in one month, the amount that made them indifferent from receiving 10,000 FCFA today. The amounts used in this question were 10,500, 11,000, 12,500, 15,000, 17,500, 20,000, 25,000 and 30,000 FCFA, representing the respective discount factors at one month of 5, 10, 25, 50, 75, 100, 150 and 200 per cent. We then generated a binary variable taking a value of 1 when the individual belonged to the more impatient half of our sample. Below, we discuss our results when using different definitions of time and risk preferences.

The dummy variable 'already insured' takes the value 1 if the head already had health insurance. Only two forms of health insurance are present in our sample of 324 households. The first, and of relatively little importance (subscribed to by 3.4% of households), is offered by private insurers who provide insurance according to different scales and often require their clients to open a savings account

within their own institution (PAMECAS, SALAMA, etc.). The second type (21.3%) refers to compulsory insurance provided by employers of a minimal size (that is, with a minimum number of employees). Employees contribute a fraction of their wage to their firms' health fund known as *Institution de Prévoyance Maladie* (IPM), which is then used to cover employees when health problems occur. Public servants have access to a more generous type of IPM where they, their spouse and often up to two children (under 18) are insured in case of health related expenditures. Comparatively, the appeal of MHOs lies in the fact that they require the payment of affordable monthly premiums, often ranging from 150 to 350 FCFA per person covered. MHOs are particularly attractive to the large numbers of self-employed and informal sector workers who are price discriminated against by private insurers. Furthermore, as IPMs and private insurers do not offer full coverage for consultation or in-patient care and do not cover all members of a household, there is ample scope to complement this coverage with that of an MHO. We discuss this in more detail below.

Given that most MHOs charge 200 FCFA for premiums, we chose to distribute our initial bids from 100 to 300 FCFA so that we have an equal difference above and below that true market price.

Table 2 shows the random assignment of initial bids across household characteristics. One can notice an uneven distribution of initial bids: 42.9 per cent received an initial bid less than 200 FCFA (corresponding to the amount of 100 and 150), whilst 34 per cent received an amount greater than 200FCFA (250 and 300). However, our randomisation appears satisfactory across most of the household characteristics.

Table 3 displays the response pattern to the initial question on WTP, by starting bid. As expected, the proportion of individuals saying yes to the first offer is decreasing in the amount of the first bid: 91 per cent of respondents declared to be willing to pay at least 100 FCFA, 73 per cent at least 200 FCFA and only 38 per cent stated a final WTP greater than 300 FCFA. This is consistent with a downward sloping demand curve. However, there seems to be no clear pattern for the follow-up answers. On

Table 2. Random assignment of starting bids, by household characteristics

	100		150		200		250		300		
Starting bid (in FCFA)	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F-test
Gender (male=1)	0.69	0.46	0.69	0.47	0.75	0.44	0.84	0.37	0.75	0.44	1.10
Head attended primary school	0.14	0.34	0.29	0.46	0.13	0.34	0.18	0.39	0.22	0.42	1.90
Head attended secondary school or more	0.47	0.50	0.29	0.46	0.47	0.50	0.56	0.50	0.45	0.50	2.24*
Already insured	0.15	0.36	0.26	0.44	0.29	0.46	0.36	0.49	0.20	0.40	2.50**
Knowledge of insurance principle	1.93	2.39	2.24	2.44	1.91	2.41	2.22	2.50	1.69	2.37	0.53
Household size	6.65	3.42	6.64	2.97	6.73	3.52	6.71	3.42	7.18	2.74	0.28
Number of children younger than 5 years	0.69	1.08	0.64	1.02	0.60	0.81	0.58	0.96	0.65	0.91	0.14
Head is a public servant	0.14	0.34	0.14	0.35	0.21	0.41	0.25	0.44	0.24	0.43	1.26
Head is self employed	0.49	0.50	0.43	0.50	0.37	0.49	0.42	0.50	0.36	0.49	0.80
Saving device	0.53	0.50	0.50	0.50	0.55	0.50	0.65	0.48	0.55	0.50	0.78
Household income, in 10,000 FCFA	16.52	11.56	23.73	22.86	22.12	21.85	25.56	22.94	22.47	17.98	2.15*
Durables	5.79	2.91	6.55	3.13	6.55	3.26	7.53	3.72	6.58	2.85	2.47**
Reported sickness (last 12 months)	0.70	0.46	0.50	0.50	0.67	0.47	0.65	0.48	0.73	0.45	2.10*
Strongly risk averse	0.54	0.50	0.62	0.49	0.64	0.48	0.55	0.50	0.45	0.50	1.36
Impatient	0.33	0.47	0.43	0.50	0.48	0.50	0.45	0.50	0.38	0.49	1.05
N	81		58		75		55		55		
Out of 324 observations (%)	(25)		(17.9)		(23.2)		(17)		(17)		

Table 3. WTP by initial starting bid

Starting bid (in FCFA)	100	150	200	250	300	Average
Said 'yes' to the first bid (%)	91.35	79.31	73.33	54.54	38.18	67.34
Number of bids (%)						
Two bids	19.75	25.86	33.33	27.27	12.73	24.07
Three bids	16.05	32.76	22.67	20.00	27.27	23.15
Four bids	19.75	8.62	9.33	12.73	12.73	12.96
Five bids	4.94	12.07	5.33	7.27	20.00	9.26
Six	24.69	1.72	2.67	10.91	16.36	11.73
More than six	14.81	18.97	26.67	21.82	10.91	18.83
Total	100	100	100	100	100	100
Final average elicited WTP (FCFA)	241.97	352.58	324.66	323.63	299.09	304.4
Distribution per final bid:	# of obs (% wrt to N)					Total
0	3 (3.7)	2 (3.5)	4 (5.3)	3 (5.5)	–	12 (3.7)
50	4 (4.9)	1 (1.7)	1 (1.3)	4 (7.3)	3 (5.5)	13 (4)
100	12 (14.8)	9 (15.5)	10 (13.3)	7 (12.7)	11 (20)	49 (15.1)
150	10 (12.3)	6 (10.3)	5 (6.7)	4 (7.3)	5 (9.1)	30 (9.3)
200	16 (19.8)	18 (31)	20 (26.7)	7 (12.7)	12 (21.8)	73 (22.5)
250	4 (4.9)	3 (5.2)	7 (9.3)	8 (14.6)	3 (5.5)	25 (7.7)
300	20 (24.7)	7 (12.1)	6 (8)	7 (12.7)	4 (7.3)	44 (13.6)
350	2 (2.5)	1 (1.7)	–	–	3 (5.5)	6 (1.9)
400	1 (1.2)	–	2 (2.7)	–	2 (3.6)	5 (1.5)
450	–	–	–	3 (5.5)	–	3 (0.9)
500	7 (8.6)	3 (5.2)	12 (16)	4 (7.3)	6 (10.9)	32 (9.9)
550	–	–	–	1 (1.8)	1 (1.8)	2 (0.06)
900	1 (1.2)	2 (3.5)	3 (4)	1 (1.8)	3 (5.5)	10 (3.1)
1,000	1 (1.2)	4 (6.9)	4 (5.3)	6 (10.9)	2 (3.6)	17 (5.2)
1,500	–	1 (1.7)	1 (1.3)	–	–	2 (0.06)
3,000	–	1 (1.7)	–	–	–	1 (0.03)
N	81	58	75	55	55	324

Note: Number of observations = 324.

average 24 per cent of household heads answered only two questions. The average final elicited WTP is superior to the initial proposed bid, except for those who were offered 300 FCFA who, on average, declared to have a WTP of 299 FCFA. The role of initial bids on final WTP will be considered further in the analysis that follows.

Around a quarter of all individuals (22.5%) declared a WTP corresponding to the average actual market value. On average, these respondents reached the value of 200 FCFA after two bids. Around 40 per cent of respondents declared WTP between 150 and 250 FCFA. Figure 1 shows the distribution of the final WTP, by initial bid. All five formats seem to have similar patterns: spikes are concentrated at 100, 200 and 500 FCFA across the initial bids.

3.2 Determinants of WTP

Table 4 shows the results of WTP estimates using OLS for the different models described above (McNamee et al. [2010] use a similar estimation strategy). Our Tobit estimates (not shown, but available upon request) are qualitatively similar. We show the results in levels, however, using logarithms yields similar results. Our Online Appendix presents the diagnostic tests in line with those proposed in Donaldson, Jones, Mapp, and Olson (1998). Our tests indicate that the OLS specification in levels is consistent with normal and homoscedastic residuals. Column 2 of Table 4 highlights the presence of a positive and significant shift parameter, suggesting that those with more

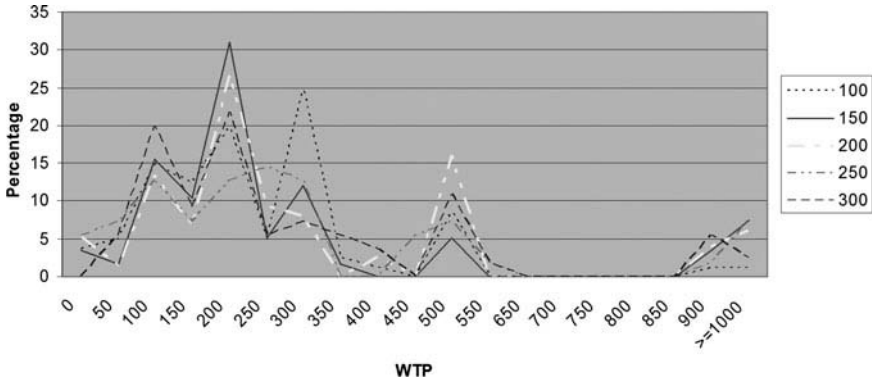

Figure 1. WTP distribution by starting bid.

follow-up bids had a higher final WTP. Results in column 3 indicate the presence of anchoring; the fact that the coefficient of the interaction term is statistically significant suggests that the response to the follow-up questions is anchored in some way to the initial bid. However, this result may be biased due to omitted variables, as the shift parameter, although significant, is not included. Indeed, there seems to be a loss in the goodness of fit of the anchoring model, compared to the shift model as signalled by R-squared. Column 4 shows the results of a model encompassing both shift and anchoring effects. In both specifications the latter model seems to fit data better, as depicted by the slight improvement in R-squared. The positive shift is confirmed and becomes even stronger. The anchoring effect remains statistically significant but turns negative, which still shows the presence of anchoring of follow-up questions to the initial bid. The negative sign suggests that overall there seems to be a dominant effect through which WTP is anchored to initial bids which are predominantly lower than final bids. This can be seen in Table 3, where a majority of 67 per cent answered 'yes' to the initial bid. The value of the starting bid does not play a significant role in predicting WTP in the first two columns. It has a differentiated impact for models 3 and 4: for $D = 0$, it has an overall negative impact (model 3) or positive impact (model 4). For those who answered more than one follow-up questions ($D = 1$) its overall impact is not significantly different from 0 in both models.

Income has a positive and statistically significant impact on the WTP; this is shown by the coefficient attached to the fifth household income quintile (the first quintile is the omitted category). Household wealth is positively and significantly related to WTP, as indicated by the coefficient of our index for wealth (number of durables).[6] Households with a larger number of children younger than five years are also more willing to pay. Heads reporting episodes of sickness over the last 12 months do not appear to have a larger WTP (the coefficient of 'reported sickness' is insignificant); this suggests that households that have been more exposed to illness are not necessarily willing to pay more to be insured. This result is somewhat surprising; we would expect such households to be more willing to purchase insurance in the face of health expenditures. Risk-averse individuals also have a significantly greater WTP. Our variable related to the discount factor (impatient) appears to have no significant impact across models.[7] The variable 'already insured', which takes the value 1 if the head has health insurance (IPM or private), appears to have no significant impact. This is not surprising if we consider, as mentioned above, that IPMs and private insurers do not offer full coverage for consultation and in-patient care fees and do not cover all members of a household. There is thus scope to complement this coverage with that of an MHO (for more on this, see Bonan, Dagnelie, LeMay-Boucher, & Tenikue [2012]).

As we can see from Table 4, the results hold if we use different specifications of preference anomalies and estimation strategy. Using different models, we obtain predicted median values of WTP. There is evidence of slight underestimation of the median WTP if preferences anomalies are not taken into consideration. However, the extent of such differences appears irrelevant: less than 3 per

Table 4. OLS Estimates of WTP (in levels), under different models

	(1)	(2)	(3)	(4)
	WTP	WTP (shift)	WTP (anchoring)	WTP (shift and anchoring)
Starting bid	0.06	0.06	–0.45**	0.68***
	(0.204)	(0.198)	(0.200)	(0.252)
D		150.00***		295.77***
		(22.421)		(74.233)
Starting bid * D			0.63***	–0.77**
			(0.114)	(0.369)
Gender (male=1)	15.77	22.94	19.89	24.88
	(26.804)	(26.282)	(26.350)	(26.320)
Head attended primary school	31.99	32.07	31.56	32.67
	(40.667)	(39.367)	(39.849)	(39.191)
Head attended secondary school or more	–20.14	–18.95	–21.71	–15.88
	(37.269)	(36.549)	(36.669)	(36.971)
Household size	–7.87*	–6.85	–7.70*	–6.06
	(4.378)	(4.230)	(4.279)	(4.205)
Already insured	35.31	17.93	17.96	22.22
	(52.798)	(51.433)	(52.037)	(52.204)
Knowledge of insurance principle	7.23	6.88	6.48	7.45
	(6.773)	(6.321)	(6.422)	(6.365)
Head is a public servant	1.01	–7.88	–8.89	–4.43
	(66.584)	(65.567)	(65.851)	(65.063)
Head is self employed	8.89	–2.03	–2.24	0.95
	(35.573)	(35.269)	(35.598)	(35.170)
Saving device	38.15	38.02	39.72	35.98
	(38.943)	(37.582)	(38.004)	(37.608)
Impatient	–2.07	12.86	11.51	10.79
	(34.063)	(33.365)	(33.729)	(33.618)
Number of children younger than 5 years	21.34	22.38*	25.45*	18.36
	(13.807)	(13.174)	(13.234)	(13.600)
Reported sickness (last 12 months)	–31.87	–30.61	–30.24	–31.38
	(28.675)	(27.874)	(28.016)	(27.938)
Strongly risk averse	65.00**	72.00**	71.71**	70.60**
	(29.217)	(28.613)	(28.801)	(28.593)
2nd household income quintile	72.94**	48.83	57.85*	43.83
	(30.230)	(29.883)	(30.037)	(29.888)
3rd household income quintile	60.40	27.15	35.60	25.13
	(40.813)	(40.119)	(40.391)	(39.984)
4th household income quintile	73.83	50.32	64.68	38.65
	(46.074)	(43.929)	(44.377)	(45.046)
5th household income quintile	165.17**	119.96*	132.48**	115.94*
	(65.296)	(64.317)	(65.407)	(63.464)
Durables	20.71***	22.22***	22.21***	21.85***
	(7.354)	(6.963)	(7.051)	(7.029)
Constant	52.89	–58.95	59.83	–176.11**
	(70.187)	(70.533)	(68.303)	(71.587)
Observations	324	324	324	324
R-squared	0.196	0.238	0.226	0.243
F-statistic	4.331***	5.697***	4.890***	6.008***
Predicted median WTP	293.6	304.9	300.8	306.8

Note: Robust standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.

cent when estimated in levels (from 293 to 306 FCFA) and less than 5 per cent difference with respect to the full model in the model estimated in logs (from 242 to 253 FCFA).

Table 4 shows that income and risk preferences are key variables in explaining WTP. As an additional check we examine the correlation of each of these controls with WTP. Our investigations show that WTP is positively related to the level of income, calculated both at individual head and household level. In both cases, WTP in the fifth quintile is significantly higher and in the first quintile is significantly lower. No significant difference arises between the second and third income quintile. Similarly, a positive and significant relationship is found between WTP and level of wealth (durables). Moreover, risk preferences are related to WTP; strongly risk-averse individuals declared a significantly higher WTP than less risk-averse agents.

3.3 Criterion Validity

The focus of this article is not on the impact of our randomised treatments, but rather on the influence WTP has on the take-up of MHO memberships. Due to space restrictions, we refer the reader to an extensive discussion on these treatments and their impacts in Bonan et al. (2012). What follows thus focuses on the impact of WTP on whether or not individuals actually purchase health insurance.

Table 5 shows our results using the OLS estimator, run on those who are not yet members of MHOs (n=324). Our results are similar if we use the probit or logit techniques. Contingent valuation of WTP has an intuitive positive effect on uptake; this result is significant at 10 per cent confidence level. It is worth emphasising that even after controlling for household and individual characteristics, and for our two treatments, we find a significant impact coming from WTP. The impact of our different controls and two treatments (*voucher* and *invitation to insurance literacy module*) are discussed in detail in Bonan et al. (2012).[8]

4. Discussion

4.1 On the Determinants of WTP

The presence of a positive and significant shift parameter leads us to reject the hypothesis of incentive incompatibility (Alberini et al., 1997) and suggests the presence of yea-saying behaviour (Kanninen, 1995). In table 4, column 4, the marginal effect of D on WTP is decreasing in the starting bid, but always remains positive. Similar results can also be found in McNamee et al. (2010). In the fields of psychology and sociology, yea-saying is known as response acquiescence and implies the tendency to agree with questions regardless of content. In the context of contingent valuation methods, Mitchell and Carson (1989) define yea-saying as 'the tendency of some respondents to agree with an interviewer's request regardless of their true views' (pages 240–241).[9]

Overall, our estimation results on the determinants of WTP are in line with the existing literature. In particular, the positive effect of income is confirmed in other studies such as Donfouet et al. (2011), Dror et al., Prabhu (2010) and Wang et al. (2009). The coefficient for risk aversion conforms to the standard expected utility model of choice under risk. The positive coefficient linked to the number of children in the household, together with a negative coefficient on household size, may suggest that in many cases insurance is conceived as a form of protection for the members of the household most at risk with their health. Of those who were already members of MHOs in our sample (36 out of the 360 households surveyed), slightly less than 50 per cent of heads insured the entire family (100% of members). Moreover, in response to the question 'who would you buy the health insurance for, at that price?', around 60 per cent of heads claimed to be willing to cover all members of the household. In many cases the head prioritised the coverage of young children, omitting himself and his spouse from coverage. Finally, despite evidence of preference anomalies in the form of positive structural shift in preferences, the distribution of estimated WTP does not change significantly across specifications.

Several concerns might be expressed on the exercise of eliciting WTP. One reason why an agent may respond untruthfully to hypothetical questions lies in the belief that answers may potentially

Table 5. The role of WTP in predicting effective purchase

Dependent variable = 1 if household subscribes to an MHO; = 0 otherwise	(1)	(2)	(3)
	Take-up (non-members of MHO)		
Voucher	0.35***	0.35***	0.35***
	(0.038)	(0.038)	(0.038)
Invited to the education session	–0.08	–0.07	–0.08
	(0.050)	(0.070)	(0.050)
WTP, in 1,000 of FCFA	0.19**	0.20*	0.20*
	(0.092)	(0.104)	(0.122)
WTP*Invited to the education session		–0.01	
		(0.172)	
WTP*Insurance knowledge score			–0.00
			(0.031)
Gender (male=1)	0.10*	0.10*	0.10*
	(0.054)	(0.054)	(0.054)
Head attended primary school	–0.09	–0.09	–0.09
	(0.070)	(0.070)	(0.071)
Head attended secondary school or more	–0.09	–0.09	–0.09
	(0.068)	(0.069)	(0.068)
Household size	0.01*	0.01*	0.01*
	(0.007)	(0.007)	(0.007)
Number of children younger than 5 years	–0.01	–0.01	–0.01
	(0.026)	(0.026)	(0.026)
Already insured	–0.17***	–0.17***	–0.17**
	(0.067)	(0.067)	(0.067)
Insurance knowledge score	0.01	0.01	0.01
	(0.011)	(0.011)	(0.015)
Head is a public servant	0.10	0.10	0.10
	(0.071)	(0.073)	(0.071)
Head is self-employed	0.01	0.01	0.01
	(0.054)	(0.054)	(0.054)
Household income, in 10,000 FCFA	–0.00**	–0.00**	–0.00**
	(0.001)	(0.001)	(0.001)
Durables	0.01	0.01	0.01
	(0.010)	(0.010)	(0.010)
Saving device	0.01	0.01	0.01
	(0.055)	(0.055)	(0.055)
Impatient	–0.02	–0.02	–0.02
	(0.055)	(0.055)	(0.055)
Reported sickness over the year	–0.03	–0.03	–0.03
	(0.052)	(0.052)	(0.052)
Strongly risk averse	0.04	0.04	0.04
	(0.051)	(0.051)	(0.051)
Constant	–0.23	–0.23	–0.23
	(0.152)	(0.150)	(0.148)
Observations	324	324	324
R-squared	0.255	0.255	0.255

Notes: All models are controlled for neighbourhood fixed effects. Robust standard errors in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.
Our results are similar if we use household income quintiles and wealth (with the DHS Wealth Index or DHS Wealth Index quintiles).

influence the actions of rulers or policy-makers; the consequence is strategic answering, aimed at maximising agent welfare (Carson & Groves, 2007). To minimise this impact, our enumerators emphasised that the survey was not done on behalf of a public agency and was also not linked to a public campaign designed to increase insurance coverage. Households were told that answers provided would not bear any consequence on their access to MHO insurance.

Another concern lies in the possible misunderstanding of the question by the respondent. This is frequent in the case of non-marketed and hypothetical goods (Carson & Groves, 2007). However, our question on WTP refers to a product that is already present in the market and can be understood easily with basic insurance principles. It is well known that familiarity with the proposed good induces well-formed preferences (McCollum & Boyle, 2005). In the case where respondents have little or no experience and knowledge, they may provide invalid responses. In this regard we control for respondents' knowledge of insurance, yet it remains insignificant in all our models. This may indicate that in our sample there is at least a minimum understanding of the product, and as such households provide a valid WTP.

It is possible that the literacy module, offered in the interval between the elicitation of hypothetical WTP and the period that respondents were asked to take-up insurance, would bias the actual WTP we obtained. Our investigation seems to indicate that this effect was marginal. One way to test for this is to check whether the impact of WTP on the actual take-up is different for those who were exposed to the literacy module from those who were not. We do not find any heterogeneous effect of WTP when combined with our literacy treatment (see Table 5, column 2).[10] This indicates that there is no discernible difference in the impact of WTP on the take-up between those invited to the module and those who were not. We argue that it is plausible that our module may have altered the WTP for some households, but our results show that this effect remains insignificant overall.[11]

4.2 On Criterion Validity

WTP appears to be a key variable in predicting the effective purchase of the product and is informative of individual behaviour. Our estimation results indicate that after having controlled for our different treatments and a series of other variables, WTP remains an important predictor of actual purchase. As such, this result presents some evidence for the validity of WTP. We also find that 62 per cent of heads who opted for MHO insurance had a WTP greater than or equal to the contribution actually charged by the MHO they selected. This proportion is in line with Bhatia and Fox-Rushby (2003), who find that 66 per cent of agents have a WTP larger or equal to the value of the treated mosquito net that they actually bought. Such similarities are interesting to notice: bed nets, a one-off expenditure, are not comparable to the health microinsurance product that requires monthly contributions. However, as Bhatia and Fox-Rushby (2003) emphasise, such studies assessing criterion validity in the health sector are scarce and as such our results bring some interesting evidence.

Finally, the different MHOs covering the city are relatively well spread across its territory so that most neighbourhoods have access to one. There is no obligation to join the closest MHO; indeed, individuals can opt for any MHO of their choosing. Differences with respect to the insurance schemes offered are minor. For these reasons we consider distance to the headquarters of the closest MHO as unlikely to have explanatory power over uptake. Also, access to basic health services is not likely to be an issue in our case; health huts and posts are evenly distributed across neighbourhoods and remain within a short distance from all households surveyed. Furthermore, all households are located within two kilometres from either one of the two health centres (regional public hospital and the mission hospital St-Jean de Dieu). Nevertheless, we attempt to control for possible heterogeneity across neighbourhoods by introducing neighbourhood fixed effects.

5. Conclusion

WTP valuations can help both policy-makers and MHOs in better understanding the characteristics of the demand for microinsurance products. This article measures different individual and household socio-economic determinants of WTP for a health microinsurance product. We find that richer, wealthier and more risk-averse heads of households are more likely to have a higher WTP for health microinsurance. Conscious of the potential limits of our elicitation strategy (bidding game), we incorporate the existing literature on the effects of 'preference anomalies'. We estimate WTP,

accounting for a structural shift in preferences, anchoring effects and the two effects together. We find evidence of slight underestimation of the median WTP if preference anomalies are not taken into consideration; however, the size of these differences appears irrelevant. Our results on the determinants of WTP are robust to the effects of such preference anomalies.

We also size the influence of WTP in predicting the effective take-up of MHOs' products. To do so we offer the opportunity to join an MHO to 324 randomly selected households. This is done according to a randomised field experiment. We find that contingent valuation of WTP has a positive and significant effect on subscription. In particular, this result is robust to different variables indicating household income and wealth. This suggests that contingent valuation of WTP is a relevant measure to use in analysing the demand for health microinsurance products in developing countries.

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Notes

1. Health care in Thiès is organised according to a tiered system consisting of health huts (staffed by community health workers), health posts (staffed by nurses and certified midwives) and health centres (staffed by medical doctors, nurses and certified midwives). The health district of Thiès has one regional public hospital and one privately run mission hospital (St-Jean de Dieu). Data for this region show that the ratio of inhabitants to health centres is seven times greater than WHO standards, while the ratio of inhabitants to health posts is in line with international norms (ANSD, 2008).
2. For example, An Fagaru, a popular MHO in Thies, proposes the following coverage: 80 per cent of consultation at health posts; 50 per cent of expenses at health centre and hospitals (regional hospital and Saint Jean de Dieu hospital). The monthly per capita premium is 200 FCFA.
3. Starting bids are randomly drawn from 100, 150, 200, 250, 300 FCFA.
4. Any arrears on premiums can lead to exclusion for that member from coverage by the MHO. Whilst the rules are strict, the administrators of some MHOs have admitted allowing for a degree of flexibility.
5. Tests for random assignments of treatments across samples are provided in Bonan et al. (2012). Randomisation with respect to voucher assignment appears satisfactory. Some significant differences between the invited and not invited samples are discussed in this article.
6. We also use alternative ways of expressing wealth: (1) the DHS Wealth Index (Filmer & Pritchett, 2001; Rutstein & Johnson, 2004), which is a synthetic index obtained by the first principal component derived from the principal component analysis on the answers on housing and dwellings; (2) quintiles of the DHS Wealth Index. Our results hold when we use either one of these measures. Results are not shown but are available upon request.
7. These results are robust to different definitions of time and risk preferences. For risk preferences we consider the subsamples of risk averse agents (always opting for the certain amount) for small and large stakes, for gains and losses. For time preferences we employ different time horizons and stakes; namely, we elicit two days, two weeks, one month and six months discount factors for small (1000 CFA) and large (10000 CFA) stakes, and we construct a dummy taking a value of 1 when the individual belonged to the more patient half of our sample for each time horizon. We use these different combinations of time and risk variables. Results are not shown, but are available upon request.
8. We argue in Bonan et al. (2012) that our sample size calculation was powered to detect statistically significant differences from the various groups. The power, for plausible pre-survey values of take-up for our different groups, is in almost all cases above 70 per cent. For the computations and more discussion on the power of our tests, we refer the reader to the Online Appendix.
9. One may argue that enumerators' ability in conducting the survey and personal characteristics may drive part of such results. However, when we include enumerator fixed effects, the previous results do not change. Moreover, the dummies identifying each enumerator are jointly insignificant.
10. The interaction of WTP with the voucher treatment yields no significant impacts. Results are not shown, but are available upon request.
11. We also investigate the interaction of WTP with the baseline knowledge of insurance principles and find no significant effect on actual purchase (column 3).

References

Acharya, A., Vellakkal, S., Taylor, F., Masset, E., Satija, A., Burke, M., & Ebrahim, S. (2013). *The impact of health insurance schemes for the informal sector in low- and middle-income countries: A systematic review* (Policy Research Working Paper 6324). Washington, DC: The World Bank.

Alberini, A., Kanninen, B., & Carson, R. (1997). Modeling response incentive effects in dichotomous choice contingent valuation data. *Land Economics*, *73*(3), 309–324.

ANSD. (2006). Troisième Recensement Général de la Population et de l'Habitat – RGPH – 2002 Senegal.

ANSD. (2008). Situation Economique et Sociale de la Région de Thies. Retrieved from http://www.ansd.sn/publications_SES_region.html.

Ashraf, N., Berry, J., & Shapiro, J. M. (2010). Can higher prices stimulate product use? Evidence from a field experiment in Zambia. *American Economic Review*, *100*(5), 2383–2413.

Bateman, I. J., Landford, I. H., Jones, A. P., & Kerr, G. N. (2001). Bound and path effects in double and triple bounded dichotomous choice contingent valuation. *Resource and Energy Economics*, *23*(3), 191–213.

Bhatia, M., & Fox-Rushby, J. (2003). Validity of willingness to pay: hypothetical versus actual payment. *Applied Economics Letters*, *10*(12), 737–740.

Blumenschein, K., Blomquist, G. C., Johannesson, M., Horn, N., & Freeman, P. (2008). Eliciting willingness to pay without bias: Evidence from a field experiment. *Economic Journal*, *118*, 14–137.

Blumenschein, K., Johannesson, M., Blomquist, G. C., Liljas, B., & O'Conor, R. M. (1998). Experimental results on expressed certainty and hypothetical bias in contingent valuation. *Southern Economic Journal*, *65*(1), 169–177.

Blumenschein, K., Johannesson, M., Yokoyama, K. K., & Freeman, P. R. (2002). Hypothetical versus real willingness to pay in the health care sector: Results from a field experiment. *Journal of Health Economics*, *20*(3), 441–457.

Bonan, J., Dagnelie, O., LeMay-Boucher, P., & Tenikue, M. (2012). *Is it all about money? A randomised evaluation of the impact of insurance literacy and marketing treatments on the demand for health microinsurance in Senegal* (Working Papers 216). Milan: University of Milano-Bicocca.

Carson, R., & Groves, T. (2007). Incentive and informational properties of preference questions. *Environmental & Resource Economics*, *37*, 181–210.

Cummings, R. G., Harrison, G. W., & Rutstrom, E. E. (1995). Homegrown values and hypothetical surveys: Is the dichotomous choice approach incentive-compatible? *American Economic Review*, *85*(1), 260–266.

Dercon, S. (2002). Income risk, coping strategies, and safety nets. *World Bank Research Observer*, *17*(2), 141–166.

DeShazo, J. R. (2002). Designing transactions without framing effects in iterative question formats. *Journal of Environmental Economics and Management*, *43*(3), 360–385.

Diop, F., Sulzbach, S., & Chankova, S. (2006). *The impact of mutual health organizations on social inclusion, access to health care, and household income protection: Evidence from Ghana, Senegal, and Mali*. Bethesda, Abt Associates.

Donaldson, C., Jones, A. M., Mapp, T. J., & Olson J. A. (1998). Limited dependent variables in willingness to pay studies: Applications in health care. *Applied Economics*, *30*(5), 667–677.

Donfouet, H. P., Makaudze, E., Mahieu, P. A., & Malin, E. (2011). The determinants of the willingness-to-pay for community-based prepayment scheme in rural Cameroon. *International Journal of Health Care Finance and Economics*, *11*(3), 209–220.

Dong, H., Kouyate, B., Cairns, J., Mugisha, F., & Sauerborn, R. (2003). Willingness to pay for community-based insurance in Burkina Faso. *Health Economics*, *12*(10), 849–862.

Dong, H., Kouyate, B., Cairns, J., & Sauerborn, R. (2003). A comparison of the reliability of the take-it-or-leave-it and the bidding game approaches to estimating willingness-to-pay in a rural population in West Africa. *Social Science & Medicine*, *56*(10), 2181–2189.

Dong, H., Kouyate, B., Cairns, J., & Sauerborn, R. (2005). Inequality in willingness to pay for community based health insurance. *Health Policy*, *72*(2), 149–156.

Dror, D., Radermacher, R., & Koren, R. (2006). Willingness to pay for health insurance among rural and poor persons: Field evidence from seven micro health insurance units in India. *Health policy*, *82*(1), 12–27.

Ekman, B. (2004) Community-based health insurance in low-income countries: A systematic review of the evidence. *Health Policy Plan*, *19*(5), 249–270.

Filmer, D., & Pritchett, L. (2001). Estimating wealth effects without expenditure – or tears: An application to educational enrollments in states of India. *Demography*, *38*(1), 115–132.

Haab, T. C., & McConnell, K. E. (2002). *Valuing environmental and natural resources: The econometrics of non-market valuation*. Northampton, MA: Edward Elgar.

Hanemann, M., Loomis J., & Kanninen, B. (1991). Statistical efficiency of double-bounded dichotomous choice contingent valuation, *American Journal of Agricultural Economics*, *73*(4), 1255–1263.

Harrison, G. W., & Rutström, E. (2008). Experimental evidence on the existence of hypothetical bias in value elicitation methods. In Charles R. Plott & Vernon L Smith (Eds.), Handbook of experimental economics results (vol. 1) (pp. 752–767). Amsterdam: Elsevier.

Herriges, J. A., & Shogren, J. F. (1996). Starting point bias in dichotomous choice valuation with follow-up questioning. *Journal of Environmental Economics and Management*, *30*(1), 112–131.

ILO. (2008). *Social health protection. An ILO strategy towards universal access to health care* (Social security policy briefings, Paper 1). Geneva: ILO.

Johannesson, M., Liljas, B., & Johansson, P. O. (1998). An experimental comparison of dichotomous choice contingent valuation questions and real purchase decisions. *Applied Economics*, *30*(5), 643–647.

Johannesson, M., Blomquist, G. C., Blumenschein, K., Johansson, P. O., Liljas, B., & O'Conor, R. M. (1999). Calibrating hypothetical willingness to pay responses. *Journal of Risk and Uncertainty*, *8*, 21–32.

Jutting, J. (2003). Do community-based health insurance schemes improve poor people's access to health care? Evidence from rural Senegal. *World Development*, *32*(2), 273–288.

Kanninen, B. (1995). Bias in discrete response contingent valuation. *Journal of Environmental Economics and Management*, *28* (1), 114–125.

McCollum, D. W., & Boyle, K. J. (2005). The effect of respondent experience/knowledge in the elicitation of contingent values: An investigation of convergent validity, procedural invariance and reliability. *Environmental and Resource Economics*, *30*, 23–33.

McNamee, P., Ternent, L., Gbangou, A., & Newlands, D. (2010). A game of two halves? Incentive incompatibility, starting point bias and the bidding game contingent valuation method. *Health Economics*, *19*(1), 75–87.

Mitchell, R., & Carson, R. (1989). *Using surveys to value public goods: The contingent valuation method*. Washington, DC: Resources for the Future.

Morduch, J. (1995). Income smoothing and consumption smoothing. *Journal of Economic Perspectives*, *9*(3), 103–114.

Morduch, J. (1999) Between the state and the market: Can informal insurance patch the safety net? *World Bank Research Observer*, *14*(2), 187–207.

Onwujekwe, O., Hanson K., & Fox-Rushby, J. (2005). Do divergences between stated and actual willingness to pay signify the existence of bias in contingent valuation surveys? *Social Science & Medicine*, *60*(3), 525–536.

Onwujekwe, O., & Nwagbo, D. (2002). Investigating starting-point bias: A survey of willingness to pay for insecticide-treated nets. *Social Science and Medecine*, *55*(12), 2121–2130.

Onwujekwe, O., Okereke, E., Onoka, C., Uzochukwu, B., Kirigia, J., & Petu, A. (2010). Willingness to pay for community-based health insurance in Nigeria: Do economic status and place of residence matter? *Health Policy Plan*, *25*(2), 155–161.

Prabhu, V. S. (2010). Tests of intrahousehold resource allocation using a CV framework: A comparison of husbands' and wives' separate and joint WTP in the slums of Navi-Mumbai, India. *World Development*, *38*(4), 606–619.

Rutstein, S., & Johnson, K. (2004). *The DHS wealth index* (Comparative Reports No. 6). Calverton, MD: DHS.

Ryan, M., Sutthi, J., & Cairns, J. (2007). Testing the external validity of contingent valuation: A field experiment comparing hypothetical and real payments. iHEA 2007 6th World Congress: Explorations in Health Economics Paper. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=993412

Voors, M. J., Nillesen, E. E. M., Verwimp. P., Bulte, E. H., Lensink, B. W., & van Soest, D. P. (2012). Violent conflict and behavior: A field experiment in Burundi. *American Economic Review*, *102*(2), 941–964.

Wagstaff, A. (2007). The economic consequences of health shocks: Evidence from Vietnam. *Journal of Health Economics*, *26* (1), 82–100.

Wagstaff, A., & van Doorslaer, E. (2003). Catastrophe and impoverishment in paying for health care: With applications to Vietnam 1993–98. *Health Economics*, *12*(11), 921–934.

Wang, H., Yip, W., Zhang, L., & Hsiao, W. (2009). The impact of rural mutual health care on health status: Evaluation of a social experiment in rural China. *Health Economics*, *18*(2), 65–82.

Watson, V., & Ryan, M. (2007). Exploring anomalies in double bounded contingent valuation. *Journal of Health Economics*, *26* (3), 463–482.

Whitehead, J. C. (2002) Incentive incompatibility and starting-point bias in iterative valuation questions. *Land Economics*, *78*(2), 285–297.

WHO. (2010). *The world health report. Health systems financing: the path to universal coverage*. Geneva: WHO.

WHO. (2011). *World health statistics*. Geneva: WHO.

World Bank. (2013) *World development indicators 2013*. Washington, DC: World Bank.