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P. G. M, Mujinja, MA (Econ), MPH, (Boston) Senior Lecturer, C. K. Makwaya, MSc (London), MPhil (Reading) Lecturer, School of Public Health and Social Sciences, Muhimbili University College of Health Sciences, P.O. Box 65015, Dar es Salaam, Tanzania and R. Sauerborn, Dr. Med, Dr. PH (Harvard), Professor of Public Health and Director, Department of Tropical Hygiene and Public Health, University of Heidelberg Im Neuenheimer Feld, D-69120 Heidelberg, Germany

Request for reprints to: P. G. M. Mujinja, School of Public Health and Social Sciences, Muhimbili University College of Health Sciences, P.O. Box 65015, Dar es Salaam, Tanzania

GENDER AND WILLINGNESS TO PAY FOR INSECTICIDES TREATED BED NETS IN A POOR RURAL AREA IN TANZANIA

P. G. M. MUJINJA, C. K. MAKWAYA and R. SAUERBORN

ABSTRACT

Objective: **To examine socio-economic and malaria related differences between males and females that may cause gender differences in willingness to pay (WTP) for insecticide treated bed nets in a poor rural area.**

Design: **A two-week-interval (test re-test) cross-sectional study.**

Setting: **Kisarawe District in coastal Tanzania.**

Subjects: **Two hundred and fifty one males and two hundred dollars females were interviewed.**

Results: **Females had about 50% of the males' income. The monthly average income was about US dollars 10.50 for females and US dollars 20.20 for males. The proportion of respondents willing to pay for an ITN, for both males and females, declined as the ITN prices increased ($P<0.05$). The mean maximum WTP difference between men and women, between both rounds were not statistically significant ($p>0.05$). Male respondents reported a higher mean number of own underfives living in the household compared to women, the difference was not statistically significant ($P>0.8$). Willingness to pay for ITN was found to be independent of having an under five child with recent history of malaria. Among both males and females, there was an association between a recent experience with malaria episode and WTP, $p=0.05$ and $p=0.02$ respectively. Among females, the proportion of those willing to pay for another person, at the lowest ITN price, was significantly higher in those with under five children in their households than in those with no underfives. This was not the case among the male respondents as the association was not statistically significant.**

Conclusion: **Contrary to expectations were was no statistically significant difference in WTP for an ITN between females and males. Further studies that link willingness and ability to pay are required in rural poor population, such studies may be valuable inputs to government policy on and planning of ITN interventions in the public and private sector.**

INTRODUCTION

Insecticides Treated Nets (ITNs) have been shown to significantly reduce malaria related morbidity, especially among pregnant mothers and children under five years of age(1,2). Due to ITNs' efficacy in reducing the burden of malaria disease, among others, the WHO's Roll Back Malaria programme emphasised the use of ITNs as one of the key malaria control measures in malaria holoendemic countries(3). The Abuja Declaration ambitiously proposed that by 2005 about 60% of the vulnerable groups pregnant women and children under five years old should be sleeping under a treated net(3). ITNs have been adopted in the Tanzanian Malaria Control Strategic Plan(4). However, in East African countries, ITNs are 'a rare commodity', and mostly available, but not necessarily affordable, in areas where ITN field trials have been implemented (5-7). In Tanzania, it is currently estimated that only 11% of pregnant mothers and 8% of children under five years of age use ITNs in the country(4).

It is known that pregnant women are more vulnerable to malaria compared to men, and concerns have been more expressed on the income differences between women and men that ultimately affect women's decisions on seeking health care(8). In willingness to pay (WTP) literature, gender as a variable, has been rarely used to estimate and evaluate factors associated to willingness to pay (WTP) and its values. Since men generally have higher incomes than women, even in developed countries(9) one might expect a higher WTP values for men, other things remaining equal. Some studies done in environmental improvements valuation have found women to have significantly lower WTP values compared to men, mainly due to differences in incomes(10,11). In some situations where men have had

significantly higher incomes than women, studies have found mixed results with some reporting findings of no significant results between males and females on predicting the effect of gender on WTP valuation(12). Therefore, factors other than income, such as perceived vulnerability to malaria, may play an important role in determining the gender differences in WTP for an ITN.

While in Tanzania concerns have been expressed on the ability of rural women to purchase ITNs at the market price, and special ITN subsidy vouchers have been offered to pregnant mothers and mothers of under fives (6), to probably enhance ability to pay for ITNs, there has been no explicit examination of the factors that may cause gender differences in WTP for ITNs. Such reasons that may cause gender differences have been recently explored in the environmental improvements valuation literature(13), and rarely in health prevention methods.

The purpose of this study was to examine, apart from income, other socio-economic and malaria related differences between males and females that may cause gender differences in willingness to pay (WTP) for insecticide treated bed nets in a poor rural area. This paper therefore, examines some of the factors that may contribute to differences in willing to pay for an ITN and their differences between men and women in a poor rural area, by analysing a contingent valuation dichotomous choice with a follow up, open-ended question format. The second section outlines the conceptual framework, and the third section presents the methodology used to collect the data. Results of the study are presented in the fourth section followed by discussion and conclusions.

Conceptual Framework: In the economics literature, it is known that WTP, among other things, may be influenced by individual's opportunities such as time and income. We hypothesize that, other things remaining equal, more men than women are likely to be willing to pay for an ITN. We also hypothesize that men are more likely to have a higher WTP for ITNS than women. However due to vulnerability to malaria, paradoxically, women may be more willing to pay for an ITN than men, although at a lower price. Respondents' preferences of males and females are assumed to be constant in a short run.

Gender differences for WTP for ITNs may arise in various ways. Assuming that men and women have the same taste for prevention of mosquito bites and identical expenditure functions, it is possible to have differences in their valuations (WTP) of the marginal health improvements. The differences could arise due to: (i). men and women having different incomes, (ii). women as prominent care-providers of young children in order to protect them from mosquito bites and hence minimise young children malaria episodes, (iii). one's recent experience of a malaria episode as a measure of perceived vulnerability to malaria, (iv). men being more likely to be willing to pay for another person in the household (altruistic behaviour) compared to women.

MATERIALS AND METHODS

The study was conducted in Kisarawe District in Tanzania between September and November 2001. The district was chosen because ITNs had not been introduced in the district, as it was done elsewhere(14,15). Residents of Kisarawe district depend mainly on subsistence farming for their living; have an estimated per capita income of about US dollars 150; as one of the poorest districts in Tanzania. The district is divided into four divisions; with a population of around 130,000 people, has an average household size of 5.4 people with a literacy rate of less than 65%. Malaria is the main cause of outpatient and inpatient attendance. It is also the major cause of mortality(16).

A multi-stage cluster sampling technique was used to select respondents. One village was randomly selected from each of the four divisions, and 120-126 households were randomly selected from each village's list of households. One adult member, as a representative of the household, was randomly selected and asked to participate in the study. In the event that he or she was not available during the period of interview, any other adult household representative was randomly selected and asked to participate in the survey. Eventually, a total of 501 respondents were selected from the four villages, and responded to the questions in the first round of data collection. For reliability of WTP responses, a test-retest design was adopted and the survey instruments were administered twice (over two rounds of two weeks interval) to the same respondents. A total of 491 (98%) of the respondents who responded to questionnaires in the first round were available and ready to respond to questions in the second round.

A contingent valuation (CV) technique was used to collect information from respondents. The CV instrument, which was pre-tested before the main survey was undertaken, had three parts. The first part asked about the socio-economic characteristics of the respondent including their health status, knowledge on malaria transmission, and current and past expenditures on malaria treatment and prevention, use of ITNs, and household wealth. This section was administered only once, in the first round. It was assumed that the individual and household characteristics would not significantly change in two weeks interval. The second part of the instrument presented the contingent valuation hypothetical ITN scenario and, in addition, an ITN and an insecticide sachet were physically presented to the respondent as done in Nigeria and Ethiopia(14,15), before the related questions were asked. The third section of the instrument, referring to the second part scenario, presented the different attributes of ITNs, including shape, prices, colours, size and make.

The respondents were asked, after giving a verbal consent, whether they would purchase an ITN at one of the three randomly assigned prices. Based on the Focus Group Discussions (FGDs) results and price observations made, the lowest price was fixed at TZS 2900 and highest price was TZS 3500. All respondents, regardless of their answer to the discrete choice question, were thereafter asked follow-up questions: "why" they answered the way they did; how many ITNs for themselves and if they would be willing to purchase one for any other household member. The dichotomous choice technique was chosen because it is easier for the people who are illiterate to respond to the choices given compared to other CV methods (17). The technique also reflected the market situation in the local shops where prices are fixed by the shop keepers.

RESULTS

a). Willingness to pay at different prices: Tables la and lb show willingness to pay at different prices for the first and second round. The proportion of respondents willing to pay for an ITN, for both males and females, declined as the ITN prices increased, and there was no statistical significant difference between the rounds. In the first round, males who were willing to pay for an ITN dropped by about 59% from 79% to about 20% while that of females dropped for 68%, from 85% to 17% when the prices increased from TZS 2,900 to TZS 3,500, respectively. In the second round, males who were willing to pay for an ITN dropped by about 57% from 79% to about 22% while that of females dropped by 60%, from 80% to 20% when the prices increased from TZS 2,900 to TZS 3,500, respectively.

Furthermore, the Tables 1a and 1b show that the proportion of both males and females who were willing to pay for an ITN at the lowest and highest prices dropped in the second round compared to those of the first round. Tables 1a and 1b also show that there were no statistical significant difference between males and females who were willing to pay for an ITN at different prices, in both rounds (P>0.05).

Apart from being asked a dichotomous question on willingness to pay at different prices, respondents were also asked the maximum amount (open-ended question) they would be willing to pay for an ITN. Table 2 shows the maximum amount respondents were willing to pay for an ITN. Females reported a higher mean maximum WTP compared to males, in the first round. The mean maximum WTP difference between men and women, in the first round, was TZS 92 with 95% confidence interval of TZS 11 to TZS 196; however, the difference was not statistically significant (P=0.08).

Table 2 also indicates that in the second round, males reported a higher mean maximum WTP than females. The mean maximum WTP difference between men and women, in the second round, was TZS 7.20 with 95% confidence interval of TZS 104 to TZS 118; but the difference was not statistically significant (p=0.89).

b) Average monthly income: Respondents were asked to report their average monthly income. The mean monthly income difference between men and women, in the first round, was TZS 10,092 with 95% confidence interval of TZS 7,816 to TZS 12, 369. In the second round the mean monthly income between men and women was TZS 10,507 with 95% confidence interval of TZS 8,278 to TZS 12,736. Generally, males had more than 200% of females' income. The average income was around USD10.50 (TZS 900=1USD) for females and USD20.20 for males, indicating a high income disparity between males and females. Table 3 shows that, in both rounds, the mean monthly incomes were significantly different (P<0.001) between males and females who participated in the survey.

Table 1

Proportion of male and female respondents who would be willing to pay for an ITN at different prices in the first and second round

a) First round WTP Response	Price levels presented to respondent					
	TZS 2900		TZS 3200		TZS 3500	
	Male	Female	Male	Female	Male	Female
Yes	79.2	84.5	40.3	37.5	19.8	16.9
No	14.4	10.3	49.6	54.4	70.1	75.0
Uncertain	6.4	5.2	10.1	8.1	10.1	8.1
Total	250	251	248	248	248	248
Significance test	P=0.30	X^2 =2.39	P=0.51	X^2=1.37	P=0.47	X^2=1.49
b) Second Round WTP Response	TZS 2900		TZS 3200		TZS 3500	
	Male	Female	Male	Female	Male	Female
Yes	78.7	80.2	40.6	35.9	22.1	19.7
No	15.7	13.9	53.4	57.3	69.9	70.1
Uncertain	5.6	5.9	6.0	6.8	8.0	10.3
Total	249	237	249	234	249	234
Significance test	P=0.86	X^2=0.29	P=0.57	X^2=1.13	P=0.68,X^2=0.99	

Table 2

The maximum amount respondents were willing to pay

	Sample	Mean	Std Error	95% Conf. Interval	
Round 1					
Male	250	2719.60	41.50	2637.80-	2801.40
Female	251	2811.40	31.80	2748.70-	2874.00
Combined	501	2765.60	26.20	2714.10-	2817.00
Difference		-91.80	52.30	-194.50	11.00
Significance test P= 0.08, t =- 1.75					
Round 2					
Male	249	2745.58	41.29	2664.26-	2826.91
Female	236	2738.35	38.27	2662.94-	2813.76
Combined	485	2742.06	28.19	2686.67-	2797.45
Difference		7.23	56.46	-103.70-	118.16
Significance test P=0.89, t=0.13					

Table 3

Average monthly reported income (TZS) by sex and round

	Observations	Mean	Std Error	95% Conf. Interval
Round 1				
Male	249	19,875.10	863.76	18,173.86 - 21,576.34
Female	248	9,782.66	771.92	8,262.27 - 11,303.05
Combined	497	14,839.44	621.53	13,617.90 - 12,369.00
Difference		10,092.44	1,158.70	7,815.88 - 12,369.00
P-value	P<0.001; t=8.71			
Round 2				
Male	247	19,989.88	865.65	18,284.84 - 21,694.92
Female	236	9,482.63	725.70	8,052.90 - 10,912.35
Combined	483	14,855.9	13,516.90	13,647.41 - 16,064.39
Difference		10,507.25	1,134.68	8,277.70 - 12,736.80
P-value	P< 0.001;	t = 9.2601		

Table 4

Relationship between WTP and recent malaria episode of the respondent's underfive child by sex of the respondent

(a) Males

WTP Response	Underfive child suffered from malaria in the last three months		
	Yes (%)	No. (%)	Total (%)
Yes	50(82.0)	91(93.4)	141(76.2)
No	10(16.4)	19(15.3)	29(15.7)
Uncertain	1 (1.6)	14(11.3)	15(8.1)
Total	61 (33.0)	124(67.0)	185

Significance test results P=0.08 X^2= 5.12

(b) Females

WTP Response	Underfive child suffered from malaria in the last three months		
	Yes (%)	No. (%)	Total (%)
Yes	74(84.1)	79(75.2)	153(79.3)
No	10(11.4)	20(19.1)	30(15.5)
Uncertain	4 (4.5)	6 (5.7)	10(5.2)
Total	88 (45.6)	105 (54.4)	193

Significance test results P=0.298 X^2=2.42

Table 5

Relaticnship between WTP and recent experience of a malaria episode by sex

a) Males

WTP for an ITN at TZS 2900	Experienced a malaria episode in the past three months Yes (%)	No. (%)	Total (%)
Yes	83(93.3)	129(79.6)	212 (84.4)
No	4 (4.5)	22 (13.6)	26 (10.4)
Uncertain	2 (2.2)	11 (6.8)	13 (5.2)
Total	89 (35.5)	162 (64.5)	251

P=0.02,X^2=8.1

b) Females

WTP for an ITN at TZS 2900	Experienced a malaria episode in the past three months TZS 2900 Yes (%)	No. (%)	Total (%)
Yes	61 (83.6)	137 (77.4)	198 (79.2)
No	5 (6.8)	31 (17.5)	36 (14.4)
Uncertain	7 (9.6)	9 (5.1)	16 (6.4)
Total	73 (29.2)	177 (70.8)	250

P=0.05, X^2= 5.92

Table 6

Relationship between willingness to pay for an ITN for any other person in the household and having an underfive child

a) Males

Has underfive(s) child in the household	Willing to pay for ITN for someone in the household Yes(%)	No(%)	Uncertain (%)	Total (%)
Yes	92 (71.3)	28 (21.7)	9 (7.0)	122 (48.6)
No	78 (63.9)	35 (28.7)	9 (7.4)	129 (51.4)
Total	170 (67.7)	63 (25.1)	18 (7.2)	251

P= 0.420,X^2=1.736

b) Females

Has underfive(s) child in the household	Willing to pay for ITN for someone in the household Yes (%)	No (%)	Uncertain (%)	Total (%)
Yes	132 (79.5)	24 (14.5)	10 (6.0)	166 (65.4)
No	58 (69.0)	23 (27.4)	3 (3.6)	84 (34.6)
Total	190 (74.2)	47(18.8)	13 (5.2)	250

P=0.041, X^2=6.404

c) Respondent's underfive child suffered from malaria in the last three months: Tables 4 (a) and (b) show the relationship between WTP (at the lowest price bid of TZS 2,900) responses and having an under five child with a history of malaria in the last three months prior the interview. The tables show that there were no significant association between willingness to pay and for an ITN and having a child with recent history of malaria, in both males and females (P=0.08, for males and P= 0.30 for females). The Tables also indicate that about 74 (84%) of females and 50 (82%)of male respondents, who reported to have had under five(s) who had suffered from malaria in the past three months were willing to pay for an ITN at TZS 2900. However, the difference between females and males was also not statistically significant (X^2 = 0,12; P=0.73).

d) Recent experience of malaria episodes: Table 5 shows the relationship between recent experience with malaria and WTP at the lowest price (TZS 2,900) in the first round. The results are not statistically different

from those of the second round. The Table indicates that, among both males and females, there was an association between a recent experience with malaria episode and WTP, P=0.05, X^2=5.92 and p=0.02,X^2=8.1 respectively. Moreover, the association was stronger among females than males.

e). Altruistic behaviour: Willing to pay for another person in the household. About 65% (162/251) and 71% (178/250) of the males and females respectively, were willing to pay for an ITN for any other member of the household, including children underfive. The difference was not statistically significant (P=0.13, X^2=2.26). But, on comparing WTP between respondents with underfive children and those without underfives in their households, we note a significant difference among female respondents. Tables 6 (a) and (b) show the relationship between WTP for any other household member and whether the respondent had underfive child living in the household. Table 6a indicates that among males, there was no statistically significant difference in WTP for an ITN between those who had an underfive and those who did not (X^2= 1.74; P=0.42). On the other hand, Table 6b shows that there was a statistical significant difference in WTP for any other person in the household among females who had an underfive compared to those who did not. (X^2= 6.40; P=0.041)

DISCUSSION

The results of this study conform to economic theory: the higher the price of a commodity, other things being equal, the lower the quantity demanded. The results and consistency of the responses, in absence of other measures of validity, validates the data; which is a theoretical link between willing and ability to pay. The proportion of respondents WTP for an ITN, for both males and females, declined as the ITN prices increased, irrespective of income differences. However more females were unwilling to pay as the price increases compared to males, implying that as the prices increased women 'remained' with less income to spend on other necessities and would not be ready to spend more on an ITN. In this study, the reliability of the WTP responses is checked by comparing the responses of the first to those of the second round between respondent's choices and the economic theory and expectations.

Because men had a remarkably higher income than women, one would expect more men to be willing to pay for an ITN than women. The results of this study indicate that there was no significant difference in the WTP for an ITN at different prices between men and women, despite their remarkable income differences. Studies have found that the systematic income gap between men and women as an important determinant of differential WTP values and, that women have significantly low WTP values when dichotomous contingent valuation techniques are used to elicit WTP (10). It is also possible that women are likely to respond to WTP questions in a way that is systematically different from men(11). Furthermore, it is possible that two individuals with the same opportunity-income level may have different preferences and perceptions on use of ITNs, which could in turn influence WTP differently. It is also possible that the degree of poverty in our study population wipes out the "income effect" on WTP values and also cancels out differences that would be observed in societies that have relatively high income.

Although men have significantly higher average monthly incomes than women, there was no significant difference in the maximum amount both men and women were willing to pay for an ITN. On average the reported incomes were very low reflecting a higher poverty level. Low levels incomes may not be sufficient to meet the daily life needs, and hence respondents are likely to have no difference in reporting more or less the same WTP for an ITN that is not a necessity among their pressing needs on a tight budget. On the other side, regardless of women's incomes, they are the household managers, and their role as informal hygiene educators and health care takers at the household level may influence responses of their WTP. In environmental valuation, women with children are more likely to pay for programmes that are more likely to reduce their risks of exposure, particularly where children may be those at risk, than men with children(13). It is also possible that in poor rural areas, where women have a great responsibility of the household affairs compared to men, income differences may not be reflected in WTP values. However, more information is required to shed light on the relationship between income, WTP, and the domestic gender roles on health preventive care, in income stricken areas.

In developing countries men and women are observed spending income on commodities for personal consumption: for men such as alcohol and tobacco, and women spending on commodities for household consumption and health care(18). This implies that incomes of members of the household may not necessarily be pooled together and controlled by one benevolent person. In Tanzania, a study on the disparity in income earning and control, between men and women, has reported that only one in four women earning an income keep most of it for herself(19). The responses on WTP could therefore be based on their defined roles in the household, as it could be in many African societies: men as overall heads and women as care takers of children with less control on income spent for children affairs. Since women would control less income, and men are in principle supposed to be taking care of most of the purchase decisions in the household, it could be possible that the women's' WTP responses were cognitively based on a narrower individual commodity basket, while that of men was based on the household's expenditure, hence narrowing the difference in WTP.

More studies need to look into the control and use of incomes in health preventive care in poor rural areas in Tanzania. More females were more likely to be willing to pay at the lowest price but fewer at the highest price compared to males. The observed difference between males and females as the price increased could be a reflection of the differences in both opportunities and preferences between them: men reported higher opportunities (incomes) compared to women, and since malaria affects more pregnant women and children under five years old who in most cases are taken care by their mothers than fathers in case of an illness episode (preferences). Donaldson *et al* have shown that for some preventive care, maternity care, strength of preferences influenced WTP, and WTP was not associated with ability to pay(20).

Men and women equally agreed to be willing to pay for an ITN for other one person in the household, however, women were more likely to be willing to pay for another person in the household, especially when the woman had an underfive child in the household. This indicates that WTP allows respondents to account for more than just individual gain(20) but also health improvements of other people in the respondent's household, especially underfive children. In this study we did not differentiate between a boy and girl child. Studies on intra-household resource allocation have shown that families in poor countries spend less on a girl's medical care compared to that of a boy child(21). In preventive care, especially for ITNs, studies are needed to explore the existence of such differences in poor rural communities in Tanzania. Furthermore, our research focused on WTP of only one adult in the household. It is not well known if the same results would be obtained if the family WTP, as a way of resource allocation, would be studied at the same time.

We also recommend that further studies to demonstrate and link ability of and willingness to pay for ITNs of a poor population. Furthermore, more studies are required to find out factors that are associated with gender differences in planning for ITN intreventions, creating social marketing messages that are gender specific and pricing of ITNs in the poor rural areas. Such studies may provide valuable inputs to government policy decisions on ITNs in both the private and public sector.

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