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Consumers' Willingness to pay for Improved Water Services in Ilorin Metropolis of Kwara State, Nigeria.

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Abstract
This study assesses the Consumers' Willingness to pay for improved water services in Ilorin metropolis; Kwara State, Nigeria. Multistage sampling techniqe was used to select sample for data collection from areas that have access to pipe-borne water and those that do not in Ilorin South and Ilorin West. Data were collected with questionnaires and oral interview from 90 respondents. Data collected were analysed with descriptive statistics and a logit model-based contigent valuation. The results show that the mean age of the respondents is 40 years, 52.22% of them have post secondary education, 34.44% have sufficient water from various sources. The mean willingness to pay of households for the improved water services is 1023.18 naira. Age, education and price significantly influence the willingness to pay by households in the area. This imply that households are willing to pay for improved water supply because of the benefits attached to it.
Keywords: willingness to pay, households, contigent valuation, water

1. Introduction

Water is literally the source of life on earth. The human body is 70% water. People begin to feel thirsty after a loss of only 1% of body fluids and risk death if fluid loss nears 10% (Park, 2002). Much of the ill-health which affects humanity, especially in the developing countries can be traced to lack of safe and wholesome water supply, that is, water that is easily accessible, adequate in quantity, free from contamination, safe and readily available throughout the year. There can be no state of positive health and well-being without safe water. Haddadin (2001) opined that economic and social development, environment and public health hinge on water and the extent of its availability. There is no economic activity, whether in production of commodities or provision of services that can be accomplished or sustained without water. In addition to meeting the basic requirements of human, animal, and plant life, water is needed to create jobs and generate incomes to maintain acceptable living standards for individuals, families and society at large. It is also needed to preserve the environment and maintain acceptable personal and household hygiene standard.

In developing countries, consumption of unsafe food and water continue to be one of the major causes of preventable morbidity and mortality, especially due to malnutrition, food- and water-borne diseases, and associated economic loss to the individual, family, and society (WHO 2009). The International Water Management Institute estimates that 3 to 3.5 million hectares of agricultural land in developing countries are being irrigated with raw or diluted wastewater. The Center for Disease Control estimates that over 4.5 billion people may be chronically exposed to aflatoxins, a toxic fungus which may occur in staple crops and result in cancers, liver diseases, and retarded growth in children. Reduced human health generally results in reduced labor productivity and lower returns to human capital accumulation (e.g. schooling and training), and therefore reduced livelihood outcomes both in the short and the long runs.

Water is one of the most valuable natural resources vital to the existence of any form of life. An adequate supply of safe, clean water is the most important precondition for sustaining human life, for maintaining ecosystems that support all life and for achieving sustainable development (Topfer, 1998). Irrespective of its importance, a global paucity of safe drinking water had been established (UN, 2002; UNEP, 2002; WHO and UNICEF, 2004). Specifically UN (2002) reports that 1.1billion people representing 18% of the world's population lack access to safe drinking water. The consequence of the failure to provide safe water is that a large proportion of human beings have resorted into the use of potentially harmful sources of water. The implications of this collective failure are dimmed prospects for the billions of people locked in a cycle of poverty and disease. UNEP (2002) estimates that diarrhea kills about 2.2 million people a year. Some two million children every year – about 6,000 a day – die from such infections. Out of this figure, 1.6 million are from the developing countries (UNICEF, 2000). UN (2002) confirmed that with adequate supplies of safe drinking water, the incidence of some illnesses and death could drop by as much as 75%. Emphasizing the importance of water, Nielson (2004) contends that safe drinking water is not just a luxury. It often makes the difference between life and death.

1.1 Nigeria Water Supply

Nigeria ranks amongst the countries with the lowest level of potable water supply in the world, despite the fact

that Nigeria was a signatory to the International Water Decade (1981-1990). The status of urban and rural water supply are characterized by low level of coverage which could be as result of weak political commitment, and la c k o f operation and maintenance culture for existing facilities, poor workmanship by contractors etc. Access to improved water is a daily challenge for most Nigerians where only 60% of the population has access to improved water, and less than 50% of the rural households have access to good portable water (National Millennium Development Goals Report, 2005). The present challenge of urban water supply are driven by rapid population growth, urbanization, budgetary constraints etc., while existing water supply projects suffer from poor funding or neglect in terms of Operations and Maintenance which has led to epileptic services and resulting in new water supplies being sourced. The public sector monopoly in the provision of water has not been successful in meeting more than a small portion of the demand for water and sanitation of residential and commercial users. Services are in critically short supply. For example, out of the 85 million people living in urban and semi-urban areas, less than half have reasonable access to reliable water supply. Many households, often the poorest, end up purchasing water from private vendors much more expensively than from the public supply. Water supply services (WSS), where they exist, are unreliable, and of low quality and are not sustainable because of difficulties in management, operation and pricing and failure to recover costs FGN, (2000). Many water supply systems show extensive deterioration and poor utilization of existing capacities, due to under-maintenance and lack of funds for operation. In addition, of all the infrastructural sectors, water has the least cost recovery, making this sector more dependent on public budget transfer (World Bank, 1995a). This low cost recovery is largely explained by the fact that this utility is often highly subsidized.

Kwara state has sufficient water resources that could meet the needs of its people. However, actual water supply is very poor in most parts of the state. While access to potable water in urban areas is estimated at 58 percent, supply is only at 12 percent in rural areas. Water infrastructure - waterworks, storage reservoirs, pump stations and distribution networks – has been poorly maintained and therefore, perform below design capacity. A significant ‘water gap' therefore exists, which calls for concerted efforts if the State must meet the Millennium Development Goal of water and sanitation for all by 2015. The combined design capacity of the Asa and Agba waterworks, two major source of water supply to the urban capital, Ilorin, is 69ml/day (million litres per day). However, the current estimated production stand just at 38ml/day, representing 55percent of installed capacity. The situation in other water projects across the State is not any better, with most of them delivering between 50-60percent of installed capacity, which is being overtaken by growing demand. Closely related to the problems of water supply in urban centres is the weakness of the revenue collection system. This has led to the continuous reliance on government subventions and allocations to provide for the maintenance of water supply systems in the state. In the face of competing priorities and dwindling government resources, government often finds it difficult to keep up with the pace of maintenance required. The result is steady deterioration of the water infrastructure.

1.2 Importance of Willingness to Pay.

The importance of willingness to pay for infrastructural facilities including maintenance and improvement has been variously amplified in literature (Fasakin, 2000; Pean, 1993; Arimah, 1995; World Bank, 1995b). In a study on the willingness to pay for the services of commercial motorcycles in Akure, Nigeria, Fasakin (2000) concludes that the long-term sustainability of commercial motorcycles can only be guaranteed, if the people are willing to pay for their services. Pean (1993) sees willingness to pay for urban services as the basis of effective demand, good infrastructural provision and maintenance and indeed responsible urban governance. Kalbermatten (1999) opines that the introduction of fees and charges for the use of freshwater can be an important stimulus to the efficient use of resources and a valuable source of revenue to ensure service to the absolute poor. He however, observed a classic dilemma under this arrangement. On the one hand, Kalbermatten (1999) observes that while additional charges are essential to provide adequate revenue for the sector and allow services to be extended and properly maintained, on the other hand, these charges are beyond the means of many people most needing the services. Fortunately, irrespective of this dilemma, the willingness of consumers to pay for water has been shown by the studies of vendors. One estimate suggests that vendors are now serving perhaps 20 – 30% of the urban population with total cost of water at 20% of household income; significantly above the official tariffs and also above the 3 – 5% of income often quoted as acceptable (Cairncross 1990). A study from Nsukka district in Nigeria reveals that consumers are willing to pay for purchasing water from private vendors instead of paying flat rate user fees for potable water, reason being distrust in the quality and reliability of publicly supplied water. The bad quality and lack of reliable supply is due to poor maintenance, following an insufficient cost recovery (World Bank, 1995b). Another study from Onitsha, Nigeria showed that the willingness for households to pay for improved water services is rather high. 8,000 out of 100,000 households were connected to the piped water systems and the rest got water from vendors. The price paid to vendors was almost twice the operational and maintenance costs of potable water (World Bank, 1995c). It becomes therefore clearly obvious that even low-income consumers are willing to pay for the service they want. This aptly confirms that willingness to pay

for any service is the foundation of the economic theory of value. Essentially, if something is worth having, then one can conveniently argue that it is worth paying for. The issue of subsidy could therefore be down–played if consumption. It becomes therefore clearly obvious that even low-income consumers are willing to pay for the service they want. This aptly confirms that willingness to pay for any service is the foundation of the economic theory of value. Essentially, if something is worth having, then one can conveniently argue that it is worth paying for. The issue of subsidy could therefore be down–played if consumption is demand driven. This would enable customers' show their demand through their willingness to pay for different levels of service. The shortcomings of the public sector to provide adequate and improved water supply to the populace and the desire of the citizenry for consistent and reliable water source, facilitated the need of this study to assess the willingness of consumers to pay for improved water supply services in the study area. The study therefore examines the willingness to pay of households for improved water supply services in Ilorin metropolis.

2. Materials and Methods

2.1 The Study Area

The study was carried out in Ilorin metropolis. Ilorin, the Kwara state capital is located on Latitude 80321N and longitude 40351 east. It covers about 1000km2. The landscape ranges in elevation in the western part from 273m to 333m and in the eastern part from 273m to 364m. Sobi hill is the dominant landform, it is an inselberg, and it is the highest point in the city (394 m above sea level.) Ilorin has a tropical wet and dry climate. Days are hot during the dry season from November to January when temperature ranges from 33^0C to 34.6^0C. Rainfall condition in Ilorin exhibits greater variability both temporarily and spatial. Relative humidity varies seasonally with an average of 79.7%. Major rivers draining the city are: Asa, Agba, Alalubosa, Okun, Osere, Aluko. Ilorin is one of the fastest growing urban centers in Nigeria. There has been a colossal increase in the population of Ilorin since it became the state capital in 1976. The population growth rate is much higher than other cities at 2.5 percent of the national growth.

2.2. Data Collection and Sampling Technique

Ilorin has three local government areas within the metropolis. This study used multistage sampling method for selecting respondents. The first stage involved the purposive selection of two local government areas within the metropolis. These are Ilorin South and Ilorin West. The second stage involved the random selection of 4 wards within the selected LGAs. The third stage involves the random selection of households interviewed for the study. A total number of 90 respondents were selected for data collection. Information was obtained on the socio-economic characteristics of the respondents and their willingness to pay for improved water services. The data collected were analysed using descriptive statistics and Logit model-based contingent valuation methods.

The logit model based on the cumulative probability function was adopted to determine the mean willingness to pay for improved water services by households and factors influencing households' willingness to pay because of its ability to deal with a dichotomous dependent variable. The logistic regression analysis is a uni/multivariate technique which allows for estimating the probability that an event will occur or not, through prediction of a binary dependent outcome from a set of independent variables (Roopa, 2000). Logit regression model was used to obtain the willingness to pay of the households for improved water services and the factors influencing the household willingness to pay. The coefficients estimates obtained were used to calculate the mean willingness to pay of the households. The logit regression model is specified as

$$\text{Pi} = \text{E}(\text{Y} = {}^{1}/_{X1}) = \frac{1}{1+e^{-(\beta 0+\beta 1x1)}} \quad (1)$$

Pi = a probability that Yi equals 1
Yi = Response of household to the willigness to pay question which is either 1 if yes or 0 if no
Xi = set of independent variables
β_0 = constant
β_1 = coefficient of the price that the households are willing to pay for improved water supply
The mean willingness to pay for of the households for improved water supply services by householdswas calculated using the formula adopted by Yussuf et. Al given as

$$\text{Mean WTP} = \frac{1}{|\beta 1|} * \ln(1+exp^{\beta 0}) \quad (2)$$

Where β_0 and β_1 are absolute coefficients estimates from the logistic regression and the Mean willingness to pay is the mean for the improved water supply by households.

2.3 Factors Influencing Willingness to Pay by Household

To assess the factors influencing willingness to pay for improved water supply by households, the household

responses to the WTP question which is 1if yes and 0 if no will be regressed against the prices the households are WTP and other socioeconomic characteristics of the household. The logit regression model is specified as:

$$Y = \frac{1}{1+exp^{-z}} \quad (3)$$

Y = Responses of household to willingness to pay question which is 1 if yes or 0 if no

$$Z = \beta_{0+}\beta_1X_1 + \beta_2X_2 + \text{----------} \beta_9X_9 \quad (4)$$

β_0 = constant
β_1- β_9 = coefficients of the explanatory variable X_1-X_9
X_1 = Gender of the respondent
X_2 = Age of the respondent
X_3 = Marital status
X_4 = Household size
X_5 = Education
X_6 = Income
X_7 = Waterflowfrequency
X_8 = Totalwatercost
X_9 = Price

3. Results And Discussion

3.1 Socio-economic Characteristics of Respondents.

Table 1 shows the distribution of the respondents by socio-economic characteristics. The age range of the respondents shows that over half of the respondents (62.22%) fall between 31 and 50 years while only 1.11% are less than 20 years in age. Average age was 40 years with the minimum and maximum ages being 19 and 72 years respectively. This shows that majority of the respondents are in the active working age and are likely to be willing to pay for improved water supply services. From the result, majority of the respondents are male which makes 65.56% of all interviewed. This may be because male-headed households are more in any population than female-headed households. The results also reveal that 80% of the respondents are married. These are likely to be willing to pay for improved water supply since they need more water for domestic purposes. Also 11.11% of them have no formal education while 52.22% of them have post secondary education. The more educated ones are likely to be willing to pay for the services knowing well the associated stress and diseases in poor quality, unreliable and insufficient water supply. A reasonable number of the respondents live in rented apartments (66.67%). These often share the costs of public utilities with co-tenants and so are likely to be willing to pay for improved water supply since the increase in the water cost will be shared among them. The most common primary occupation is civil service which account for 47.78% of the respondents. This may be because the level of industrialization/manufacturing in the state is low. Majority of the respondents do not engage themselves in any secondary occupation (86.67%), this may be why some have low monthly income. Almost half of the respondents have pipe-borne water as their main source of water and only 34.44% of them claimed the have sufficient water from their various sources. Over half of the respondents indicated that at least one member of their households had suffered either typhoid, diahrhoea or cholera which are mostly water-borne. Such will be willing to pay for improved water supply to prevent such diseases recurring.

3.2 Result of Mean Willingness to pay

The mean willingness to pay for improved water supply services in the study area was estimated to be N1023.18. The logit regression was used to obtain the parameter estimates as specified in the methodology. The result of the logit regression as shown in table 2 implies that the mean willingness to pay is positive and respondents are willingng to pay above the existing monthly water charges. This result is in line with the result obtained by Omonona and Fajimi 2011 in which the mean willingness to pay for improved water supply in Ibadan metropolis was N1108.80. It is also in line with that of Adepoju and Omonona 2009 in which the coefficient of percentage willingness to pay is positive. The chi-squared (the LR Statistic) shows that the overall goodness-of-fit of the model is statistically significant at 5% level. The McFadden pseudo R-squared indicates that 31.42% of the variance was explained by the independent variables.

3.3 Determinants of willingness to pay Logit Regression Result

Multivariate logit regression was used to determine the factors that influence the probability of households' willingness to pay for improved water supply services in the study area. The chi-squared (the LR Statistic) shows that the overall goodness-of-fit of the model was statistically significant at 5% level. The McFadden pseudo R-squared indicates that 45.34% of the variance was explained by the independent variables.

The variables Age, Educational Qualification and Price are significant while Gender, Marital status, Household size, Income, Waterflow Frequency and Total water cost do not significantly influence households' willingness to pay for improved water supply in the study area. However Gender, Income and Total watercost positively influence the WTP while Marital status, Water flow frequency and Household size have negative relationship with it.

As the age of the respondent increases, the likelihood of households paying a given price for improved water services reduces. This result reveals the marginal effect on probability of households paying for the services with respect to age is -0.0758. This means that as the age of household head increase by one year, the likelihood of paying for improved water supply services decreases by 0.0758. This result is in line with Omonona and Fajimi, 2011.

Likelihood of households paying a given price for improved water supply services increases as the respondent's educational level measured by the number of years spent in school increases. This result shows that the marginal effect on probability of households paying for the service with respect to educational level is 0.2110. This means that as the number of years spent in school increases by one year, the likelihood of paying for improved water supply increases by 0.2110. This is also in line with Adepoju and Omonona, 2009 and Omonona and Fajimi, 2011. Also the likelihood of households paying a given price for improved water supply increases as the price of the improved services increases. This indicates that the marginal effect on probability of households paying for the service with respect to price increases by 0.0104. This implies that for every one naira increase in the price of the improved water supply services, the probability of the households paying the price increases by 0.0104. The positive relationship between Mean Willingness to pay for improved water supply services in the study area and Income of respondents conforms with the economic theory which states that an individual or household's demand for a commodity depends on his or her income and that income and quantity demanded are positively related, except in the case of inferior goods (Bayrou, 2002) therefore an increase in respondent's income will increase the likelihood of paying for improved water supply services.

4. Conclusion

The importance of providing clean, reliable and sufficient water at all time in both urban and rural areas cannot be overemphasized. Many people are faced with the challenges of obtaining adequate potable water supply everyday. This study shows that majority of the respondents are willing to pay for improved water supply. The estimated mean willingness to pay for improved water supply services of 1023.18 naira showed that the demand for improved water supply services is associated with benefits deriveable from the services. The variables Age, education, price that the respondents are willing to pay are important factors that influences WTP for improved water supply services in the area of study. Based on the findings of this study the following recommendations are made:

- Policies associated with improved water supply services in the state should put water expansion projects into consideration so as to bridge the supply gap due to incessant population expansion.
- The revenue collection system of the water corporation should be re-organized for better performance since consumers will be willing to pay for improved services. This will ensure continuity and make avaiable fund for adequate maintainance.
- The positive relationship between Income and willingness to pay for improved water supply suggests that households with low income should be put into consideration when designing policies in line with improved water supply services. This low income group should be encouraged to diversify their sources of income.
- Public-private partnership in water projects should be embarked on by the government since this will improve maintenance of water infrastructures in the state and proper accountability of revenue generated.
- It was found that most of the respondents are willing to pay for improved water supply services. An important policy implication from this finding is that it will be good if the water utility sets objectives which can abandon the low-level equilibrium trap, which is the cycle of poor service, little revenue and low reliability, and can lead to attain high level equilibrium, which is high private connections and high reliability of the service given the improved water supply service is provided.
- The strong positive relationship between educational level and willingness to pay for the improved water service shows that there is a need to educate people about the benefits associated with improved water services.

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Table 1: Socio-economic Caracteristics of Respondents

Variable	Frequency	Percentage
Gender		
Male	59	65.56
Female	31	34.44
Total	90	100.00
Age group		
<20	01	01.11
20-30	16	17.78
31-40	30	33.33
41-50	26	28.89
51-60	11	12.22
>60	06	6.67
Total	90	100.00
Marital status		
Single	12	13.33
Married	72	80.00
Widowed	06	06.67
Total	90	100.00
Education		
None	10	11.11
Primary	09	10.00

Secondary	23	25.56
NCE/ND	29	32.22
HND/BSc	18	20.00
Others	01	1.11
Total	90	100.00
Primary Occupation		
Civil Servant	43	47.78
Personal business/Trade	23	25.55
Artisan	07	07.78
Private salary job	04	04.44
Farming	06	06.67
Others	07	07.78
Total	90	100.00
Secondary Occupation		
None	78	86.67
Trading	05	05.55
Farming	07	07.78
Total	90	100.00
House ownership		
Self	25	27.78
Rented from Individual	60	66.67
Government Quarters	03	03.33
Family House	02	02.22
Total	90	100.00
Main water source		
Pipe-borne water	44	48.89
Water tanker	06	06.67
Borehole	08	08.89
Well with pump	13	14.44
Well without pump	17	18.89
Others	02	02.22
Total	90	100.00
Water sufficiency		
Yes	31	34.44
No	59	65.56
Total	90	100.00
Why No access		
Connection fee too expensive	16	17.78
House not mine	44	48.89
Not interested	06	06.67
Not yet available in my area	23	25.56
Others	01	01.11
Total	90	100.00
Disease Experience		
Diarrheoa	12	13.33
Typhoid	38	42.22
Cholera	07	07.78
Change in teeth colour	01	35.56
None	32	01.11
Total	90	100.00

Source: Computed from field survey.

Table 2: Result of Logit Regression

Variable	Coefficient	Standard error	Z-Statistic
Constant	-6.9145	1.9725	-3.518***
Price	0.0068	0.0018	3.83***

***Statistically significant at 1%, degree of freedom 1, loglikelihood -32.6928, Chi-squared (LR statistic) 29.96, McFadden R-squared 0.3142, significance level 0.0000

Table 3: Determinants of willingness to pay Logit Regression Result

Variable	Coefficient	Standard Error	Z-statistics
Gender	0.4566	0.9678	0.47
Age	-0.0758	0.4554	-1.67*
Marital status	-1.1587	1.2129	-0.96
Household size	-0.1352	0.2006	-0.67
Educational level	0.2110	0.1222	1.73*
Income	0.1964	0.3364	0.58
Waterflowfreq	-0.9184	1.0433	-0.88
Total watercost	0.0011	0.0009	1.32
Price	0.0104	0.0028	3.50***
Constant	-3.4531	3.0899	-1.11

***Statistically significant at 1%

*Statistically significant at 10%

Chi-squared (LRstatistics) 43.00, degree of freedom 9, significance level 0.0000, loglikelihood -25.9196, McFadden R-squared 0.4534