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An Analysis of Willingness to Pay (WTP) for Improved Water Supply in Owo Local Government, Ondo State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author TJA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors GJO and KA managed the analyses of the study. Author GJO managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Willingness to pay for social services is often regarded as a means of ensuring the long-term sustainability of such services. This paper examines willingness to pay (WTP) for improved water supply in Owo Local Government Area of Ondo State, Nigeria. Data were collected from 256 households through multi-stage sampling from eleven political wards in Owo. The data were analysed using descriptive statistics and logit regression. Results show that 43% of the residents obtained water from public utility while 20.3% and 18.8% obtained water from well and borehole respectively. Majority of the residents (70.3%) were dissatisfied with unreliable water services but were willing to pay for improved water supply (74.9%). Residents were willing to pay an average sum of N1,617.64 (US$4.5) per month for improved water supply services. The results of logit regression analysis revealed that gender, a frequency of water, education, household size, income, quality of water and connection charges were the factors influencing residents' willingness to pay (WTP) for improved water supply services in the study area. There is a need for government to create enabling the policy for public-private partnership in the improvement of water supply in the study area.

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1. INTRODUCTION

The importance of water to human life and socio-economic development of any community cannot be over-emphasised. Water is essential for household, industrial, tourism and cultural purposes as well as the sustenance of human settlement [1,2]. In homes, water can be used for drinking, bathing, washing, cooking and general sanitation. However, availability of water for the afore-mentioned uses has been a subject of concern in developing countries especially in the rural and semi-urban area of the country. Where it is available, the quality and quantity are far from the internationally accepted standard [2].

According to [3], about 844 million people globally lack access to clean water supply while 2.5 billion people have no access to adequate sanitation. It was also estimated that 319 million people are without access to improved water supply in sub-Saharan Africa. The consequence of this is that a large proportion of human beings have resorted to the use of potentially harmful sources of water. In this regard, millions of people are locked up in a cycle of poverty and disease. For example, [4] recorded that more than 14,000 people die each day, 11,000 of them being children are under five years of age. [5] inserted that there are more people in the world hospitals today, suffering from water-borne diseases than any other ailment. 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 [6]. The Water Project [7] concludes that poor water and sanitation conditions cause about 80% of all diseases and more than one-third of all deaths in developing countries. [8] 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, [9] asserted that safe drinking water is not just a luxury because it's a necessity: it usually creates a distinction between life and death.

Apart from the above problems, lack of clean and safe water is a significant challenge in rapidly growing urban centres in developing countries, and Nigeria is not an exception. Prior to independent, development of water supply and management in Nigeria showed that the colonial administration expanded domestic water supply as part of the overall programmes to improve the level of personal hygiene and environmental sanitation throughout the country. Unfortunately, as opined by [10] the priority accorded domestic water supply by the colonial administration had not been sustained by the post-independence government of the country.

Nigeria has 36 State Water Agency (SWAs) and 12 River Basin Development Authorities (RBDAs). Several of these water agencies and authorities still depend on obsolete water equipment. This has been primarily due to reduced management by Government and private sector organisation in the water sector compared with other sectors such as oil and gas, energy, housing among others [11]. Despite this, government in recent times has made efforts to ensure provision of water supply in Nigeria, yet only 47 percent of the population had access to an improved water source in 2008. In 2010, 54% had access to safe water in urban households while less than 50% of rural households had access to good portable water in Nigeria as against the National target of 65% [12]. Public water supply is regarded as a measure of access to safe water. However, access to public water supply among Nigerians has decreased extensively from 14% in 1990 to 6% in 2008 [13]. People still depend very much on other sources such as hand-dug wells, ponds, streams, river and shallow wells for their water needs. During the dry season, some of these sources dry up, and households have to invest a substantial amount of their resources to get water of doubtful quality.

Water supply in Owo Local Government Area varies from one place to another, and so does the cost. While some have access to public water supply (from Ondo state water corporation through the Ose water scheme), others people have to pay for water supply from private vendors. Owo LGA still suffers from a limited water supply, and present supply coverage is less than 50% [14]. According to [15] out of 300 respondents sampled, only 27, representing 9% of the entire population derive and enjoy water supply from the public pipe-borne water. This shows a sharp reduction from the number of people the scheme (Ose water scheme) was meant to serve (26,000 people) when it was first

constructed. The scheme which was expected to pump about 130,000 gallons of water to Owo LGAs per day is operating below expected capacity.

Overtime, the quantity of water supplied to the town on daily basis is grossly inadequate and could not solve the problem of water shortage in the study area. In this wise most of the households still depend on other water sources (i.e. water tankers, boreholes, well etc) for water supply. The implication of the above scenario is that the citizens in the study area are groaning under the acute safe water supply and would be willing to pay for the supply of potable, reliable and quality water supply.

Improving the quality of water supply is a priority for both rural and urban development, thus far, the strategies of international donor and the government have been supply driven. Therefore the value that consumers place on the social services especially safe water has been ignored. Without a price for an improved water supply service, there will be no control system which will result in a distortion in water use. Since water lays between the two extremes private and public goods, the market mechanism cannot be expected to provide signals in the form of prices. Public policy must therefore intervene in some form. In this regard, one must rely on alternative methods that will elicit the value a typical consumer places on improved water supply service by stating their willingness to pay (WTP) for the service. This will help in determining how low income people value improved water supply.

This research therefore endeavours to examine how much residents in Owo LGA are willing to pay (WTP) for improved water supply as well as establishing the possible factors affecting their WTP.

2. LITERATURE REVIEW

Two major issues were discussed in this section, namely - water supply and willingness to pay (WTP).

Evidence abound that public water supply in rural and semi urban centers in developing countries is generally inadequate and unreliable to compare with the rate of population growth [10,14,15,16,17]. For example, in the work of [17] about 10% of the population in Lagos is being served by water utility, Lagos State Corporation. According to [14], only 9.3% of the entire population derive and enjoy public water supply. Similarly, [16] observed that 3% of the people in Ijebu North area have access to safe pip-borne water. However, the submission of these authors is that the rest of the population depend on other sources of water supply such as borehole, shallow well, pond, stream among others.

Several authors have established that water is one of the non-market goods [18,19,20] and value of water quality cannot be estimated through market system but through user or consumers' evaluation. This involves predicting what users are willing and able to pay for the proposed water improvement program in the future. Willingness to pay generally refers to the economic value of a good to a person (or a household) under given conditions [21]. Willingness to Pay (WTP), according to [22,23] is the maximum amount that a household is willing to pay voluntarily for services rather than do without the services. The value of willingness to pay for good or service may be elicited in two ways – namely directly (through careful investigation from consumers or user) and indirectly (through examination of market prices).

Issues on WTP for water supply in developing countries have been amplified in literature. However, those that are relevant to this study will be reviewed in this section.

[24] carried out willingness to pay for improved water supplies in Onitsha, Nigeria. In this study, 235 samples households were interviewed in person to elicit households' willingness to pay for improved water services. The findings of this study showed that households have both ability and willingness to pay for improved public water supply. The study further noted that if the improved water supply system can be provided to the people at lower prices below private vender's price, social welfare would be increased.

[25] analysed household's willingness to pay for improved water service in Abbottabad district. Systematic random sampling technique was used in selecting 2,779 respondents through a well structure questionnaire. While the study discovered that household members are willing to pay for improved water services, the study concluded that location, sources of water, tap

water, level of education, reliability of water services and quality have significant effect on households' WTP for improved water services in Abbottabad district.

[26] determined the consumers' WTP for improvements in water supply system and identified factors affecting WTP. The study hypothesised that the satisfaction of consumers about water services, their belief about water management system and the affordability might influence WTP more for water. Logistic regression was used to describe the impact of various factors on WTP.

[27] examined households' willingness to pay for improved water services in urban areas in Nebelet town, Ethiopia. The study sampled 181 households through random sampling. The study used probit model to identify socio-economic factors that affect the willingness to pay (WTP) of households. The study discovered that inhabitants of Nebelet town are willing to pay for improved water supply service if it is provided at an affordable price. The study revealed that income, distance, water expense, bid, education, level of existing water satisfaction, marital status and sex were associated with households' willingness to pay for the provision of improved water services.

[10] assessed households' water-use demand and willingness to pay for improved water services in Ogun State, Nigeria. The study discovered that marital status, education, connection charges, household size and income are the correlates of willingness to pay for improved water services in the study area. [28] observed in their study that people are willing to pay a significant amount in cash on regular basis in order to have access to reliable water supply.

Generally, from the above literature it was established that households were willing and able to pay for improved water supply services, provided if the water supply charges are affordable. Studies also recommended that socioeconomic characteristics of the households should be considered whenever tariff rate is to be designed. Therefore, the above literature provided some sound footings to this study to value residents' WTP for improved water supply in Owo local government area of Ondo State.

3. THE STUDY AREA

Owo Local Government Area is one of the eighteen LGAs in Ondo State, Nigeria (Fig. 1a). Owo LGA is located in the Northern Senatorial District of Ondo State and it consists of 11 political wards. Owo LGA consists of Iyere, Ipele and Emure-Ile, Uso Emure-Ile, Isuada, Ago-panu, Ipemen, Amurin and Kajola (Fig. 1b). Its land area is about 15,500 square kilometres and is located between latitude 7° 15' North and longitude 5° 35' East of Greenwich meridian. It is 150 meters above sea level and enjoys abundant rainfall of over 1,500 mm annually. The temperature is relatively high throughout the year with an average daily temperature of about 27°C (80.6^0F), with marked seasonal changes in rainfall and relative humidity. The Local Government falls within the sub equatorial region characterized by a monsoon climate. Available records show that Owo Local Government Area (LGA) has been experiencing population increase before independent. For example Owo LGA had a population of 30,662 in 1952, 80,413 in 1963 and 155,000 in 1991. In 2006, the population census was 222,262 (National Population Commission, 2006) and was projected to about 358,230 by population statistics in 2017. The increase in population has however led to increase in water demand and has outstrips water supply in the study area.

3.1 Water Supply Situation in Owo

Public water supply for Owo is by the Ondo State Water Corporation (OSWC) through the Ose water scheme which was commissioned in 1960. The design capacity of the scheme was to supply 2,000m^2 of water/day to the town on a daily basis. The water is distributed through a network of pipeline system with a total length of 13.4 km and diameters ranging from 75 mm to 200 mm. This distribution system covers an area of about 500 ha [29]. The storage capacity in Owo consists of one water reservoir of 2,115m^3.

Although, the initial production capacity of Ose dam in 1984 could only serve 26,000 people. However, as the town begin to experience population increase and area expansion, an

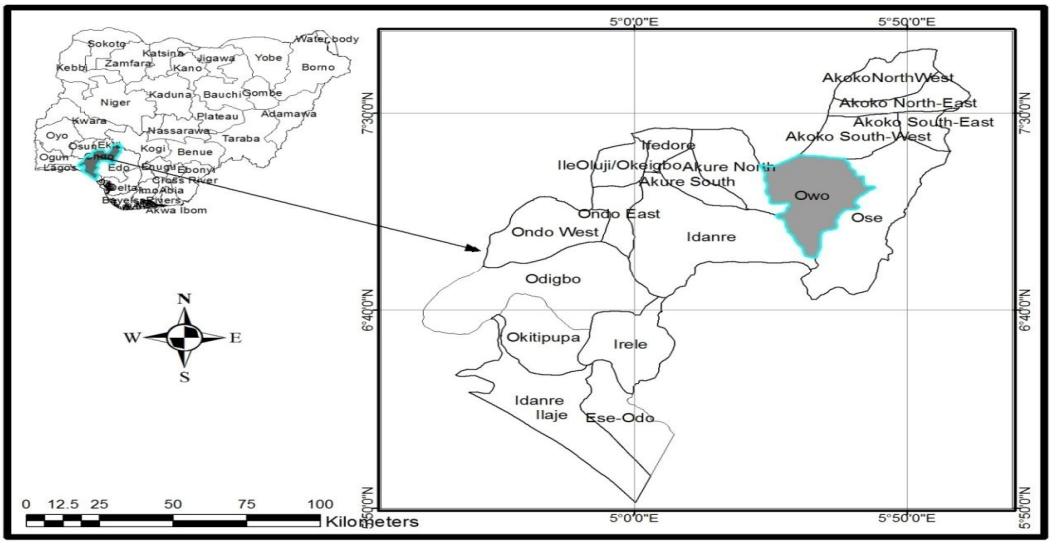

Fig. 1a. Map of Nigeria showing Ondo State in relation Owo LGA
Source: Ministry of Housing and Urban Development Ondo State, 2017

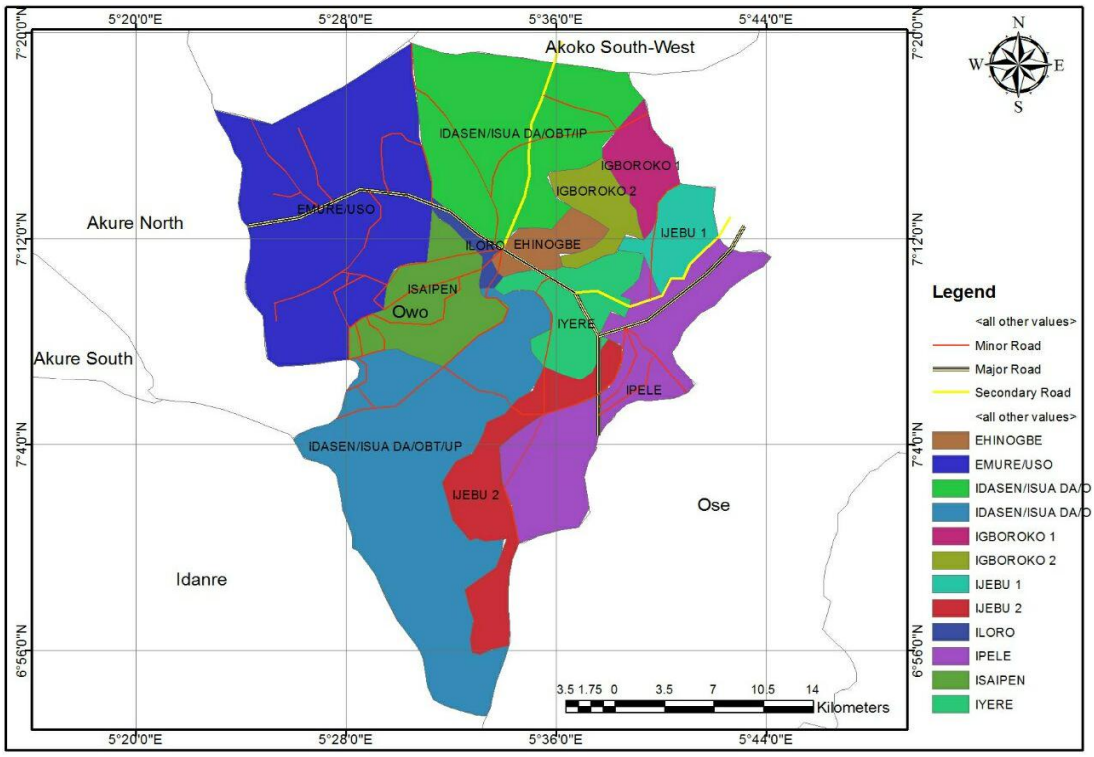

Fig. 1b. Map of Owo Local Government in relation to the 11 Political Wards
Source: Ministry of Housing and Urban Development Ondo State, 2017

agreement was reach to increase the capacity of Ose dam to serve 66,000 people. This plan was proposed and was to commence - as Ose Water Scheme. But up till now the scheme is yet to be completed. In 1998, World Bank, Federal Government and Ondo State Government agreed to rehabilitate, improve and expand public water supply network. After nineteen years, the anticipated repairs and expansion is yet to commence and the water supply situation

in the study area is becoming worse further. Although, Ose water scheme was expected to pump about 130,000 gallons of water to Owo per day, unfortunately, its operation is below capacity and the quality of the water supplied to the town on daily basis is grossly inadequate [15]. As a result of this, every household in the study area has to travel long distance from their various houses in search of safe water for domestic needs. At present, households in the study area does not only rely on public water supply, they also rely on water supply from other sources such as untreated piped water from groundwater sources, shallow boreholes, shallow wells and pond, springs, lakes, rivers, and streams [30].

4. MATERIALS AND METHODS

The research methodology comprises of both field work and data analysis. Preliminary work conducted involved the review of the literature and development of data collection techniques and instruments before the commencement of the field work. Reconnaissance survey preceded field data collection which involves discussions with the respective stakeholders in the study area.

4.1 Data Collection and Sampling Technique

The multistage-sampling techniques were employed for this study. The first stage involved stratification of Owo Local Government area into eleven political wards as delineated by Independent National Electoral Commission [31]. The second stage involved random selection of political wards from the existing political wards. Pilot survey revealed that there were 11 political wards and 6 were selected randomly. These political wards include Ehinogbe, Isaipen, Igboroko I, Isuada/Ipenmen, Ijebu II, Ipele. The third stage involved the identification of streets in the selected political wards from which every tenth streets were systematically selected. Presented in Table 1 is the number of streets and buildings in each ward. The fourth stage was the selection of buildings sampled in each of the streets. Every 5^{th} buildings were systematically selected while the first building was randomly selected. A household head were selected from each of the selected building. Using this procedure, a total of two hundred and fifty six respondents (256) were selected. Primary data was collected with the aid of a well structured questionnaires and interview schedules. The data was analyzed using descriptive statistics and logit regression.

The Contingent Valuation Method (CVM) was considered to be appropriate when dealing with estimation of goods that is not traded in the conventional market. The method is often referred to as stated preference methods which use actual revealed behaviour of consumers in the market. The method directly asks consumers' WTP for a non marketed good under a given condition or a prescribed circumstance. Contingent valuation method has been applied as an effective valuation technique in developed and developing countries to address water quality improvement and sanitation [31,32,33]. For instance, [32] applied CVM to study households' WTP for improved sanitation services. [33] also adopted CVM to analyse determinants of quality and quantity values of water for domestic uses in the steelport sub-basin of South Africa.

4.2 Data Analysis

For this work, descriptive statistics such as frequency distribution tables, mean, pie-chart and bar graph were used to analyse the

Table 1. Number of buildings in selected streets

S/N	Political wards	No of streets Identified	No of buildings in each ward	No of streets selected in each ward (10%)	No of buildings in selected streets (5%)
1	Ehinogbe	88	910	9	46
2	Igboroko1	62	523	6	26
3	Ijebu	48	904	5	45
4	Ipele	36	935	4	47
5	Isaipen	112	1010	11	51
6	Isuada	65	820	7	41
	Total	**411**	**5102**	**42**	**256**

Source: Author Field Survey, 2017

socioeconomic characteristics of the respondents and water supply situation in the study area. The logit model based on the cumulative probability function was adopted to determine the mean willingness to pay for improved water supply services by residents and factors influencing residents' willingness to pay for improved water supply. The logistic regression analysis is a uni/multivariate technique which allows for estimating the probability that an event will either occur or not, through prediction of a binary dependent outcome for a set of independent variables [34].

4.3 Willingness to Pay for Improved Water Supply

The logit regression model was used to obtain the willingness to pay for improved water supply. The coefficient estimates obtained were then used to calculate the mean willingness to pay of the residents.

$$P_i = E\left(Y = \frac{1}{Xi}\right) = \frac{1}{1 + e^{-(\beta 0 + \beta 1 Xi)}} \quad (1)$$

Where,

- P_i is a probability that Y_i = 1 (WTP for improved water supply).
- Xi is a set of independent variables
- Y is dependent variable (responses of residents' willingness to pay question which is either 1 if yes or 0 if No)
- β_0 is the intercept which is constant
- β_1 is the coefficient of the price that the residents are willing to pay for improved water supply.

The mean willingness to pay for improved water supply by residents was calculated using the formula adopted by [35,36] where mean WTP was taken to be negative and the ratio of regressed constant to bid price coefficient.

4.4 Factors Influencing Residents' Willingness to Pay

To determine the factors influencing residents' willingness to pay for improved water supply, resident responses to the WTP question will be regressed against water supply and socioeconomic characteristics of the respondent. The regression logit model is specified as:

$$Y_i = \frac{1}{1 + exp^Z} \quad (2)$$

Where Y = responses of household WTP which is either 1 for Yes and 0 for No

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots\ldots\ldots\ldots\ldots + \beta_{10} X_{10}$$

- X_1 = Gender of the respondents (male = 1, female = 0)
- X_2 = Age of the respondents (yrs)
- X_3 = Marital Status (married = 1, Otherwise = 0)
- X_4 = Household size (number of household)
- X_5 = Education (no of years spent in school)
- X_6 = Occupation of the respondents (formal = 1, 0 otherwise)
- X_7 = Household Income (Naira/month)
- X_8 = quality of water (good quality = 1, otherwise = 0)
- X_9 = reliability of water (reliable = 1, otherwise = 0)
- X_{10} = connection charge (naira/month)

5. RESULT AND DISCUSSION

5.1 General Description of the Respondents

Willingness to pay for public water supply is affected by gender, income, marital status, education, occupation among others [37,38]. Table 2 showed that majority of the respondents (76.2%) were within the age bracket of 21 – 60 years and the mean age was 44.61 years. It can be observed that majority of the respondents were within the active population. The percentage of male and female were 56.6% and 43.4% respectively. This implied that there were more female and male in the study area. The result shows that majority (73%) of the respondents were married; 31.3% were civil servant while 44.5% had tertiary education. The table also revealed that 29.4% of the respondents earned below ₦18,000 (US$50)per month while the average monthly income was ₦65,941.14 (US$183.01).

5.2 Source of Water Supply

The larger percentage of the respondents indicated that they obtained water from piped water were 43.2%, 20% from well and 18% from borehole. The proportion of respondents that obtained water from surface water were 9.7% while 7.7% obtained water from vendors, pond, river and packaged water sources (Fig. 2).

Table 2. Socioeconomic characteristics of the respondents

Variables	Frequency	Percentage
Age		
Below 21	31	12.1
21 – 40	99	38.7
41-60	96	37.5
Above 60	30	11.7
Mean age	44.61 years	
Gender		
Male	111	43.4
Female	145	56.6
Marital status		
Single	39	15.2
Married	187	73
Separated	25	9.8
Widow/widower	5	2
Occupation		
Student	48	18.8
Self employed	70	27.4
Trading	40	15.6
Civil Servant	80	31.3
Artisan	18	7
Educational qualification		
No formal education	56	21.9
Primary school	9	3.5
Secondary school	77	30.1
Tertiary	114	44.5
Monthly income		
Below ₦ 18000	75	29.4
₦ 18001 – ₦ 43000	24	9.4
₦ 43001 – ₦ 68000	60	23.4
₦ 68001 – ₦ 93000	28	10.9
₦ 93000 – ₦118,000	24	9.3
Above ₦118001	45	17.6
Mean monthly income	65,941.41	

Source: Author fieldwork 2017

Also, 70.3% of the respondents indicated that they were dissatisfied with the current water supply while 29.7% were satisfied. The reason for this dissatisfaction is not farfetched from the opinion of the majority (72.6%) of the respondents that public water supply was irregular in the study area.

5.3 Distance to Source of Water

Economic losses occasioned by lack of water in Africa have been placed at US$ 28 billion [39]. Much of this economic loss is incurred through time lost to travelling for fetching water [39,40]. Analysis in Fig. 3 shows that 18.9% of the sources of water were within the household while others need to travel distances ranging from less than 100m to 1000m. It can however be observed that majority of the respondents have to travel some distance to obtain water and also time is being wasted to wait for turn to fetch water. This therefore constitutes constraints to accessibility in the study area.

5.4 Residents' Willingness to Pay for Improved Water Supply

According to [41] on human right to water, people are not expected to pay more than 3% of their household income, this does not mean that the person should not pay for water at all. In this wise, water cost should be on relative terms rather than actual cost of producing and transporting water to households. This however opens room for debates and diverse interpretation of the meaning of human right to water [42]. With the current situation of water supply in the study area (unreliable and

inaccessible), respondents were asked on how comfortable they were with respect to their willingness to pay for improved water supply services. Analysis in Table 3 shows that 75% of the respondents were willing to pay for improve water supply services provided if the tariff is affordable, while 25% of the respondents were not willing to pay for the service. This implies that most of the respondents were still willing to pay for improved water supply in the study area. However, the erratic water supply situation in the study area calls for government's intervention and international donors. Further analysis revealed different reasons why proportion of respondents that were not willing to pay for water supply services in the study area. Out of 25.1% of the respondents that were not willing to pay for the service, 6.6% were of the opinion that the cost of water supply is too high (i.e it is unbearable), 2.7% noted that they cannot afford to pay for the scheme, this may be because of their level of income (low income). About 7.3% of the respondents asserted that the scheme is not important to them due to the fact that they depend on alternative sources of water supply (i.e. water surface, borehole, well among others) while 8.5% of the respondents opined that they are not satisfied with present supply of water due to the fact that the water supply is not regular.

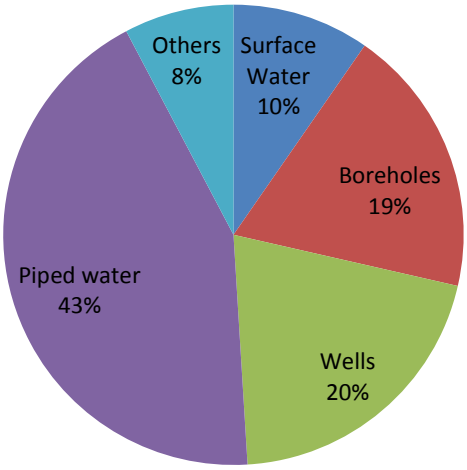

Fig. 2. Sources of water supply to households

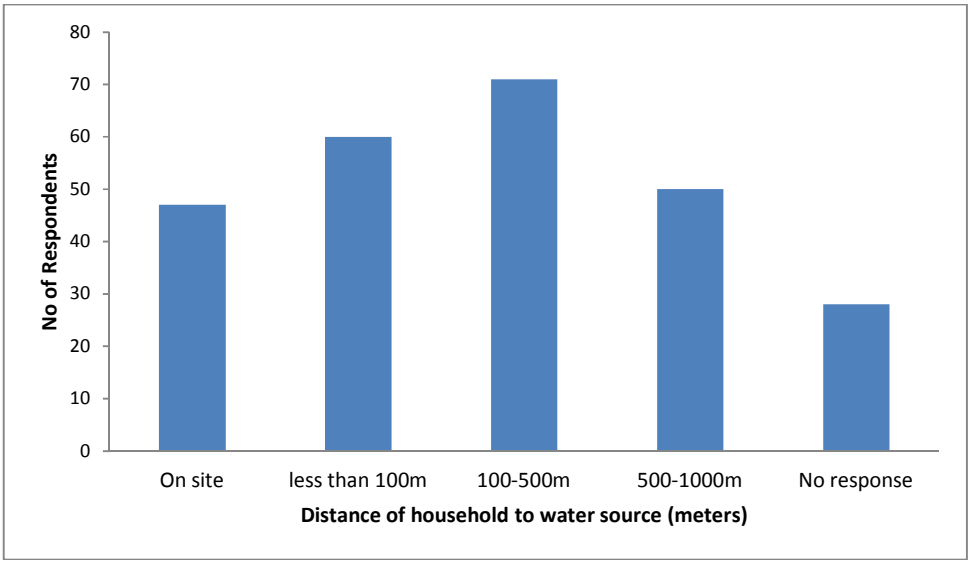

Fig. 3. Distance to source of water

Table 3. Distribution of number of respondents willing to pay for improved water

Willingness to pay	Frequency	Percentage
Yes	192	75
No	64	25
Total	256	100.0

Source: Author's field work, 2017

5.5 Mean WTP of Water Supply

The mean WTP for improved water supply was estimated to be –(0.888569/-0.0005493) = N1,617.64 (US$4.5) per month (Table 4). The logit regression was used to obtain the parameter estimates as specified in the methodology. The mean WTP results can be attributed to the fact that majority of the household surveyed were middle and low income earners. This result goes in line with the theory that higher household income earners have the tendency to pay more pay for public water supply. Also majority interviewed were living in a rented apartment and jointly pay for public utilities such as electricity and thereby makes the amount payable for such service to be relatively low.

5.6 Analysis of Factors that Affect WTP

Logit analysis in Table 5 was used to determine the factors that influence the probability of residents' willingness to pay (WTP) for improved water supply services. The diagnostic statistics reveals that the chi square value (LR-statistics) for the model is significant at 1% level which means that the explanatory variables jointly influence residents' willingness to pay. The Pseudo R squared indicates that 62.9% of the variance was explained by the independent variables. The signs show the direction of change in the probability of the willingness to pay for improved water supply given the change in explanatory variables. A positive sign shows increase in the probability of willingness while a negative explains the converse.

The results shows that respondents' gender, frequency of water, education, household size, income, quality of water and connection charges are the significant factors that influence respondents' willingness to pay for improved water supply services while age, marital status and occupation does not significantly influence their willingness to pay. The model agrees with the findings of [22,27,43]. Furthermore, frequency of water, education, household size, income and quality of water are positively signed which implies that they will increase the tendencies of households' willingness to pay for improved water supply. Frequency of water supply is positively related to the WTP for improved water supply services and this shows that the respondents will be more willing to pay if the frequency of current water supply services is improved upon. Education status is positively signed which means that highly educated and informed households have the higher probability of willing to pay for improved water supply. This is in line with [27,44] which found that residents with high level of education have the probability to pay more than lesser educated once. Household size is positively signed which implies that large household has higher probability of willing to pay for improved water supply and small household.

Household income as expected to determine WTP of residents is in line with the study carried out by [43,45,46,47]. The result also confirms economic theory, which states that an individual/ household demand for particular commodity depends on his/her income. Therefore an increase in respondents' income will increase the likelihood of paying for improved water supply service. Quality of water supply is positively signed, this implies that household will be willing to pay for water supply if the water is of good and certified quality. However, gender and price are negatively signed. The implication of Gender which is negatively related to willingness to pay is that men are willing to pay for improved water supply. This result is contrary to believe that women are more likely to pay more because they stay longer in the house and men. This corroborates the findings of [48]. Also, the implication of connection charge

Table 4. Results of Logit regression

Variables	Coefficients	Std. Err.	Z	P>|z|
Constant	0.888569	.3020207	6.25	0.000
Price	-.0005493	.0001759	-3.12	0.002***

****Statistically significant at 5%, degree of freedom 1, log likelihood -140.75458, Chi-squared (LR statistics)*
Source: Author's field work, 2017

Table 5. Determinants of willingness to pay for improved water supply

Variables	Coefficient	Standard error	z	P>|z|	[95% Conf. interval]	
Gender	-1.506844	.5271881	-2.86	0.004***	-2.540114	-.4735746
Age	.015584	.0179116	0.87	0.384	-.019522	.0506901
Marital Status	.2797404	.330017	0.85	0.397	-.3670811	.9265619
Frequency of water	.2503398	.0967384	2.59	0.010**	.060736	.4399437
Education	.1249591	.0534863	2.34	0.019**	.020128	.2297903
Household size	.5910106	.1725043	3.43	0.001***	.2529085	.9291128
Income	-.0000123	4.53e-06	-2.71	0.007***	-.0000212	-3.42e-06
Quality of water	1.527635	.4686277	3.26	0.001***	.6091414	2.446128
Connection charge	-1.26904	.3365112	-3.77	0.000***	-1.92859	-.6094907
Occupation	-.0004744	.0002911	-1.63	0.103	-.0010449	.0000961
Constant	2.803106	2.124777	1.32	0.187	-1.361379	6.967591

Number of observations = 259; Pseudo R2 = 0.6199; LR Chi square (10) = 118.42; Prob>Chi2 = 0.000; Log likelihood = -85.249152;
**** Significant at 1% level, **significant at 5% level*
Source: Author's fieldwork 2017

which is negatively related is that higher connection charges may reduce the tendencies of willingness to pay for improved water supply by household. This is in support of [49] which found that high connection charges discourage household decision to seek for improved water supply.

6. CONCLUSION AND RECOMMENDATION

The study has examined residents' willingness to pay (WTP) for improved water supply in Owo Local Government Area of Ondo State, Nigeria. In examining residents' willingness to pay (WTP) for improved water supply, the socioeconomic characteristics of the respondents; residents' willingness to pay for water supply and factors influencing residents' willingness to pay for water supply were examined. It was established in this study that majority of the respondents were within the active and productive population (21 – 60 years). Many of the respondents were educated with few having no formal education. Although more than three-quarters of the respondents obtained water from State Water Corporation, a majority of these respondents were dissatisfied with the current water supply due to its irregularity in supply. Despite the irregularity in the water supply, a majority of the respondents were still willing to pay for reliable and quality water. The study also discovered that gender, the frequency of water, education, household size, monthly income, quality of water and connection charge were the important factors that influence WTP for improved water supply services in the study area.

The following recommendations were made on the basis of findings from this study. Government and other donors should endeavour to repair or replace obsolete and outdated pumps at Ose waterworks, repair/change damaged pipes and laying of new water pipelines to the entire length and breadth of Owo township to ensure availability of safe water in every part of the city so as to reduce the distance travelled in getting safe drinking water, and enhance easy distribution of water supply in the study area. Since respondents are willing to pay, the policy which can consider middle and low-income group should be designed in relation to supply of improved water services. There should be proper sensitization programme about the need for improved water supply in owo, to prevent water-borne disease such as diarrheal among others. Provision of quality water should be the priority of the government when designing policy for a water project. Government should ensure genuine public/ community participation in water supply planning such as policy articulation, project prioritisation, design execution, routine monitoring and management.

The study, therefore, concluded that despite the unreliable water supply in the study area, most of the households are still willing to pay for water supply services provided it can be improved. Government should, therefore, create enabling policy for public-private partnership in water supply to secure the much-needed fund to improve the service delivery since respondents in the study area are willing to pay for reliable and improved water service delivery.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Sources of water and distance to water source

Variables	Frequency	Percentage
Source of water		
Surface water	26	10.2
Boreholes	48	18.8
Wells	52	20.3
Piped water	110	43
Other	20	7.8
Distance to water source		
On site	47	18.4
Less than 100m	60	23.4
100-500m	71	27.7
500-1000m	50	19.5
No response	28	10.9

Source: Author fieldwork 2017

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