Households' Willingness to Pay for Improved Water Supply: Application of the Contingent Valuation Method; Evidence from Jigjiga Town, Ethiopia

Shemelis Kebede Hundie[1]
Lamessa Tariku Abdisa[2]

Water problem in developing countries like Ethiopia is twofold: low coverage levels and poor quality that require urgent attention to reduce associated health and social consequences. Understanding this fact, the government and NGOs are currently carrying out several activities to improve the coverage and quality of water supply. To this end, willingness to pay of households that are expected to be benefited from the project should be analysed. The central objective of this study is, hence, to estimate Willingness to Pay (WTP) of households for better-quality water service provision and identify its determinants by using Contingent Valuation Method (CVM) in Jigjiga city. We estimate Willingness to Pay (WTP) for better quality of water supply service on cross-sectional survey of households in Jigjiga city taking 210 sample households randomly drawn. The highest relative WTP for improved water supply service was found in the city with the highest percentage of respondents being unsatisfied with the current water supply both in terms of quality and quantity. Response to the hypothetical scenario shown that sampled households stated that their mean WTP of 94 cents per 20 litres. The results of logit model

[1]**Shemelis Kebede Hundie**, Lecturer Department of Economics, Jigjiga University, Ethiopia:E-mail: shimelis.kebede@jju.edu.et
[2]**Lamessa Tariku Abdisa** , PhD candidate in Economics at the University of Milan, Italy :E-mail: lamessa.abdisa@unimi.it

revealed that household income, family size, water source, age of the respondent and bid value have significant effects on WTP for improved water service provision. The implication is that it is better take into account the socio-economic characteristics of the households in planning and designing water supply projects, which may serve to set rigorous demand oriented projects that can sustain the service delivery.

Keywords: *Willingness to Pay, Contingent Valuation Method, Improved Water Service, Jigjiga*

JEL Classifications: Q50, Q510

Introduction

Access to and use of safe drinking water has a great contribution to health, productivity, and social development. Fresh safe water is essential for the survival and well-being of humankind. Access to safe water is a pre-requisite for the realization of many human rights, including those relating to people's survival, education and standard of living

However, many people in developing countries continue to rely on unimproved water sources. According to the United Nations Development Program (UNDP, 2006), nearly one-sixth of the world's population, the majority in developing countries, obtains drinking water from unimproved sources, and in many developing areas, progress in expanding clean water coverage is modest. In Sub-Saharan Africa, for instance, the proportion of the population that depends on unimproved sources has declined only slightly, from 52 percent in 1990 to 44 percent in 2004 (UNDP, 2006). As part of the Millennium Development Goals, the international community has set a goal of reducing the proportion of people without sustainable access to safe drinking water by 50 percent by 2015 compared to its level in 1990 (UN, 2010).

Like any other developing countries, Ethiopia has long been characterized by limited access to safe drinking water and sanitation services. For instance, in 1990, only 19 percent of the country's population had access to a safe drinking water supply (MoFED, 2008). The problem is compounded in rural areas of the country where it is obligatory to travel more than an hour to fetch water. These long hours spent in fetching water take a significant amount of time that could be employed in other income-generating activities and has an implication on production and productivity.

Recognizing the deep-rooted drinking water problem in the country, the current government of Ethiopia has increased resource allocation to provide safe drinking water for its population. As a result, the proportion of government budget that goes to water and sanitation service development grew from 2.8 percent to 4.5 percent between 2000/01 and 2004/05 (MoFED, 2006). As a result, access to improved water supply increased from about 19 percent to 52.5 percent between 1996 and 2007 (MoFED, 2008). However, access to quality water services still varies greatly across geographic regions of the country. For instance, of the total population in Ethiopia Somali regional state, only 9.9% gets their water demand from piped water, 4.5% from bore-holes, 9.5% from Dug-wells and the total improved technology used for supply of water in the region is only about 24.2% while about 76% of the technology used in the region employed for water supply is unimproved technology. This figure shows low proportion of the population in the region is getting safe drinking water compared to other regions of Ethiopia. The 2007/08 report of Ministry of Health (MoH) shows that the water coverage in Somali region stood at 37.9% with the urban area water coverage is about 61.6% and rural area coverage 32.9% (Global Sanitation Fund, 2009).

Jigjiga city has a critical water-supply problem. A few wells were drilled with assistance from Non-governmental organizations and are in

operation (FDRE, 2002). However, the existing water supply is unable to meet the current water demand in the city. The rapid population growth aggravated the water problem of the city.
To improve the water supply situation of the city the old boreholes need rehabilitation. The pumps and all the pipelines also need replacement. The construction of additional boreholes is also needed to fulfil the current demand. However, all these activities require high capital outlays. The service beneficiaries are required to pay for the improved water services. Thus, to improve the water supply situation of the city, demand side information is highly required. This demand side information enables policy makers to design appropriate water tariff that is consistent with government policy and enhance the long-term viability of the service. Therefore, the objective of this study is to estimate the households' willingness to pay for the improved water service by taking Jigjiga city as a case study. The main objective of this study is to estimate households' willingness to pay /WTP/ for improved water supply by taking Jigjiga city as a case study.

Literature Review

The willingness to pay (WTP) survey for safe drinking water has been conducted in many places in both developed and developing counties using different methods of analysis, among which CVM is the most commonly applied one. It is argued that studies employing this method in environmental research have witnessed robust progress. In particular, with advances in the use of econometric analysis, survey research methods, sampling and experimental design, it enabled better understanding of consumer preferences and policy applications in the last 50 years (Smith, 2006 cited in Zelalem and Fekadu, 2012). Since this study will employ CVM, few empirical studies (among the many) that used CVM and those relevant to this study will be reviewed in this section.

Zelalem and Fekadu (2012) applied the CVM to estimate willingness to pay for improved rural water supply in Goro-Gutu District of Eastern Ethiopia. Both binary and ordered probit models were used to examine the determinants of willingness to pay. Results indicate that households using water purification methods earn better annual income, participated during the early phase of project implementation and are spending more time in fetching water and hence are more likely to pay. Whereas those households with large family members, which use reliable water sources from convenient water points and got higher starting bid values are less likely to pay. This implies the need to take the specific characteristics of rural households and their service level demand into account in planning rural water supply projects, which may contribute to set sound cost recovery system that can sustain the service delivery.

Bogale and Urgessa (2012) estimated households' willingness to pay for improved rural water supply and its determinants in Haramaya district using the contingent valuation method. The study used primary data obtained from a survey on randomly selected rural households. The authors used double bounded dichotomous choice elicitation method administered by face to face interview. The data was analyzed using descriptive statistics and bivariate probit model. Response to the hypothetical scenario shown that sampled households expressed their WTP with a mean WTP of 27.30 cents per 20 liters/ jerry can. The results of bivariate probit model revealed that household income, education, sex, time spent to fetch water, water treatment practice, quality of water and expenditure on water have positive and significant effects on WTP for improved water service provision, while age of the respondent has a negative and significant effect.

Ahmad, Haq and Mustafa (2007) analysed willingness to pay for improved water service in Abbottabad district using contingent valuation method. Systematic random sampling technique was adopted for the collection of data. Four hundred and fifty five households, which consist of 2779 households' members, were interviewed at their premises through a well-structured and pre tested questionnaires. The study used Multinomial Logistic model to estimate the effects of the independent variables on the WTP. Results show that location (urban/rural), sources of water, tap water, and level of education, reliability of both water services and quality have significant effect on households' WTP for improved water services in Abbottabad district.

Whittington et al. (1991) carried out a CVM study to estimate households' willingness to pay for drinking water in Onitsha, Nigeria. The authors used a bidding game to elicit households' willingness to pay for improved drinking water. In this study 235 sampled households were interviewed in person to elicit households' willingness pay for improved water services. The findings of this study showed that households have both ability and willingness to pay for improved public water system. The study also indicates that if the improved public water system constructed water services can be provided to the people at lower prices below private vendor's price and social welfare would be increased.

Kamaludin, Rahim and Radam (2013) assessed consumer's willingness to pay for domestic water services in Kelantan, Malaysia using contingent valuation method. A Contingent Valuation Method (CVM) was employed to 552 households in the state for analysis regarding to the services and probit model was used to analyse the data obtained through the survey. The results show that bid price, household income and household size have statistically significant impact on WTP and they are as expected in earlier studies. The calculated mean WTP is RM 0.60 applied on the first $35m^3$ and it is much higher from current water price. The new water price can be recommended for any improvement and upgraded services to high standard in services in the future which is satisfying consumer's needs.

Nam and Son (2004) used CVM and Choice Modeling (CM) to assess household demand for the improved water service in Ho Chi Minch city, Vietnam. The study employed the logarithmic random utility model for the CVM study and the multinomial Logit for the Choice Modelling to analyze survey responses. The study also used Turnbull estimates for non-piped water households to see the surveyed households' willingness to pay at various connection fee levels. The findings from the CVM study indicate that the coefficients of household size, number of children in the households, water pressure and composite income (household income and bid price) were found significant for piped water. And the coefficients of fridge, bottle and composite income (household income and bid price) were found statistically significant for non-piped one. The findings of this study also clearly indicate that the probability of yes decreases with the increase in the availability of water, and increases with the increase in composite income and increase in household size. The study result also shows that those households who owns fridge and uses bottled water have no willingness to pay for the improved water services. The results of the choice modelling indicated that the coefficients of the three attributes namely, monthly water bill, water quality and water pressure had expected sign and statistically significant.

Generally, the literatures above recommended that contingent valuation method is workable technique to measure households' WTP for non-marketed goods (like water resource) in the developing and the developed countries. Therefore, the given literature above provided some sound footings to this study to value households WTP for improved water supply in Jigjiga town.

Materials and Methods

Sources of Data and Sampling Design

Jigjiga is a city in eastern Ethiopia and the capital of the Somali Region of the country. Located in the Jigjiga Zone approximately 80 km east of Harar and 60 km west of the border with Somalia, this city has an elevation of 1,609 meters above sea level. The city is located on the main road between Harar and the Somali city of Hargeisa, and is known for incense production.

According to data from the Central Statistical Agency in 2005, Jigjiga has an estimated total population of 98,076 of whom 50,355 are men and 47,721 are women. The 1997 census reported this town had a total population of 65,795 of whom 33,266 were men and 32,529 women. The total population of Jigjiga city increased and reached 199,756 as of 2012. This city is the largest settlement in Jigjiga woreda.

The climate of Jigjiga is semi-arid, with the influence of mountain climate, with hot and dry summers and cold winters. This is ascribed to the fact that Jigjiga is situated on a plain surrounded by mountains and to its distance to the sea and its effects.

The study mainly depends on primary sources of data. The data used for the analysis of the study will be collected from Jigjiga town. Jigjiga town is classified in to ten administrative kebeles. Six kebeles based on their severity of water supply problem namely: kebele 01, 02, 03, 06, 07 and 09 were included in the sample.

A total of 201 households were selected by using the systematic sampling method. The number households were selected from each kebeles depending on the size of the population in each kebeles. Once the number of households was selected from each kebele using Proportional Probability to Size (PPS) approach, each household from each kebele was selected using systematic sampling technique.

Empirical Model Specification and Analysis

In order to estimate the WTP using data collected from the households, a simple linear WTP function is specified. The model to be employed in this study makes use of the random utility model constructed by Hanemann (1984) in which the underlying model is based on indirect utility function.

Letting W_0 is the water service at status quo, W_1 is the water service after improvement, Y_i is income of the household and X_i is a vector of individual characteristics excluding income of the household such as household size, attitude of the household toward the existing water service and other socio economic characteristics of the household. Then the household utility function for water services at status quo level can be formulated by;

$$U_0 = U(W_0, Y_i, X_i) \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

And the household utility function for water services after improvement of water service is given by;

$$U_1 = U(W_1, Y_i, X_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

In random utility model (RUM), it is assumed that each individual knows his/her utility function or preferences with certainty, and there are some components that cannot be observed by the researcher and treated as random variable (Hanemann and Kanninen, 1998). Denoting ε_i random term, unobserved component of the utility and the corresponding indirect utility function for water service at status quo and after improvement is V (W_0, X_i) and V (W_1, X_i) respectively, the household's utility function can be formulated as follows assuming additive specification of utility function:

For the household utility function for water at status quo;

$$V_0 = V\ (W_0, Y_i, X_i)\ +\ \varepsilon_0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3)}$$

And household utility function of water service after improvement is given by;

$$V_1 = V\ (W_1, Y_i, X_i)\ +\ \varepsilon_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(4)}$$

Where ε_0 and ε_1 are error terms.

To get water from the improved services respondents will be asked to pay some amount of money, let say M_i. Thus, the household will choose the improved water services if the utility from program, net of the required payment, exceeds utility that the household would get at the status quo level. This can be expressed as:

$V(W_{1,}Y_i - M_i,\ X_i) + \varepsilon_1 > V(W_{0,}Y_i, X_i) + \varepsilon_0$ ………………… (5)

This can be rewritten as:

$V(W_{1,}Y_i - M_i,\ X_i) + \varepsilon_1 - V(W_{0,}Y_i, X_i) - \varepsilon_0 > 0$………………. (6)

However, we do not know the random part of preferences and can only make probability statements about yes and no. The probability of a yes response is the probability that the respondent thinks that he/she is better off in the proposed scenario. This is given by:

Pr (yes) $= V(W_{1,}Y_i - M_i,\ X_i) + \varepsilon_1 - V(W_{0,}Y_i, X_i) - \varepsilon_0 > 0$……..…………. (7)

$= V(W_{1,}Y_i - M_i,\ X_i) - V(W_{0,}Y_i, X_i) + \varepsilon_1 - \varepsilon_0 > 0$ (8)

And the probability that the housed responds no/ not willing to pay/ for the improved water service is given by

$Pr\ (No)\ = 1 - Pr\ (yes)$ ………………………………………… (9)

To proceed in estimating the parameters of equation (8), it is necessary to specify the nature of the random terms.

Letting $\varepsilon_1 - \varepsilon_0 = U_i$ and assuming U_i independently and identically distributed (IID) with mean zero, the probit model for the above specification is defined as;

$Y_i^* = \beta' X_i + U_i$………………………………………………………... (10)

Where Y* is unobservable latent variable which takes the value of 1 if the response is yes and zero otherwise, X is a set of explanatory variables, β is a parameter to be estimated and U_i is error term. Y* is the actual Willingness to pay (WTP) for the proposed water supply improvement which is defined as:

$$Y_i = \begin{cases} WTP = 1, if\ Y* \geq M_i \\ WTP = 0, if\ Y* < M_i \end{cases}$$

.... (11)

The probability of yes for particular respondent is given by

$\Pr(Y_i = 1/X_i)$=Pr $(Y_i \geq M_i/X_i\ )$

=Pr $(\beta' X_i + U_i \geq M_i/X_i)$

=Pr $(U_i \geq -\beta' X_i + M_i/X_i)$.. (12)

If we assume the distribution is symmetric

$$\Pr\left(Y_i = \frac{1}{X_i}\right) = \Pr(U_i \geq -\beta' X_i + M_i/X_i)$$

=$F(X_i\ \beta')$... (13)

Where F (.) is cumulative distribution function (cdf)

Following the above specification and the assumption made about the error term, the probit model built for the latent variable, WTP, is formulated as follows:

$WTP_i = \beta' X_i + \varepsilon_i$ .... (14)

Where WTP is the willingness to pay which can take on the value of one or zero, X_i is a set of explanatory variables and ε_i is the error term.

The household's willingness to pay for improved water supply may depend on income, socio-economic characteristics of the household such as household size, attitude of the household toward the existing water service, age, education, and gender, source of water, initial bid and wealth of the household shelter as suggested in the literature discussed above. More specifically, we can specify the model for households' preferences for the improved water service stated in Equation (14) above as follows:

$$WTP_i = \alpha + \beta_1 BID + \beta_2 AGE + \beta_3 INCOME + \beta_4 HHSIZE + \beta_5 GENDER + \beta_6 SHELTER + \beta_7 EDUCATION + \beta_8 SOURCE + \varepsilon_i \quad (17)$$

The study employed contingent valuation method to analyse the household's willingness to pay for the improved water service in Jigjiga town. The empirical analysis for the above specified model was done using logit model employing STATA 13.

Estimation and Discussion of Results

Descriptive Analysis

As it can be seen from the Table 1 below, majority of the respondents (76%) get water from non-piped sources, mainly from water vendors. The reason why households are relying on this sources of water is that they have no other alternative source of water. This source is not safe to rely on both for price is highy expensenve when compared to piped water and is also not clean. Households getting water from other source mainly, from water vendors, are asked to pay 4.5 birr on average per bucket or 20 liters. Moreover, fetching water from this sources or waiting time takes households on average about 16.2 miniutes.

Above all, 58% of households whose water source is other than pipe reported that water borne diseases have ever appeared in the family due to unclean nature of water from this source.

Table 1

Main Source of Water and Water Borne Diseases

Source of water	**Water borne deases** Yes	No	Total	
Pipe	0%	24.38%	24.38%	$Pearson\ chi2(1) = 90.3$
Other sources	58.21%	17.41%	75.62%	$P - value = 0.000$
Total	58.21%	41.79	100%	

Source: Survey result, 2015

Households' average daily water consumption is about 74.89 liters with a maximum of 180 liters and minimum of 20 liters. The average per capita consumption of water for a typical household with an average family size reported above (4.8) is 15.60 liters.

Table 2

Households Daily Water Consumption, Price and Time for Fetching

Variable	Observation	Mean	Maximum	Minimum
Price of water from other source	153	5.54	5	4
Households daily water consumption	201	74.89	180	20
Time required to fetch	153	16.2	-	50

Source: Survey Result, 2015

The perception of households about current water supply in the town and its quality is considered as one of the factors behind their willingness to pay for improved water supply.

Table 3

Households Perception about Current Water Supply and Quality

Variable		*Frequency*	*Percentage*
Water quality	*Good*	*14*	*6.97*
	Average	*17*	*8.46*
	Poor	*170*	*84.58*
Water quantity	*Good*	*1*	*0.50*
	Average	*33*	*16.42*
	Poor	*167*	*83.09*
Water	*Yes*	*37*	*18.41*

Purification	*No*	*164*	*81.59*

Source: Survey Result, 2015

The level of satisfaction of respondent with the existing level of water service is extremely low. Only 6.97 % percent of the respondents have rated the current water quality in the city as good and only 0.5% which is extremely low has the perception that the current water supply is good in terms of quantity. With Cross tabulating the results it is confirmed that those who are dissatisfied are those who are getting water currently from other sources and seeking more improved services and are more willing to pay for such service.

As it be seen from above table 3, majority the households (84.58%) rated the currently quality of water as poor. Only 6.97% of the households have perceived as good quality of water in the town. Even though this figure is not significant, these households are those who get water currently from pipe water. Regarding the quantity of water supply, 83.09% of the respondents ranked as poor while only one respondent, 0.5%, has the perception of the current water supply in the town is good. This shows that the water problem in the town is in severe situation.

A question related to the quality of water was whether the household uses any purification method before they drink. The majority of respondents, 81.59%, said that they do not use any type of purification method such as boiling, before they use for their family consumption including drinking.

In total of 210 individuals received a questionnaire that included the contingent valuation question; due to item non-response 9 are available for analysis. The responses to the valuation question at the various bid levels this is reported the following table

Table 4

Willingness to Pay Responses for the Bid Values

BID Value	*Number HHS surveyed*	*Share of Yes*
25 cents	*50*	*1*
50 cents	*50*	*0.98*
80 cents	*50*	*0.66*
1 birr	*50*	*0.62*

Source: Survey Result, 2015

The share of yes responses decrease as the bid increased. Furthermore, the share of yes ranges between 1 and 0.62, so the bid vector seems to have been appropriate.

Econometric Results and Discussions

Multivariate econometric analysis was also applied in addition to the descriptive analysis conducted so far in order to have a broader framework in identifying factors accountable for the willingness to pay for improved water service.

The logit result shows that the model fits the data well (see Table 7). The pseudo R^2 for the logit estimation is 0.4936. This value of R^2 indicates that 49.36% of the variation in the WTP is explained by the explanatory variables included in the model. This value of R^2 is high enough as low R^2 is expected from regression estimation results obtained by using cross sectional CV studies. Mitchell and Carson (1989) suggested, "The reliability of a CV study which fails to show R^2 of at least 0.15, using only a few key variables, is open to question." According to this standard, the result of this regression output is reliable. Moreover, Likelihood Ratio Chi-Square test of whether all predictors' regression coefficients in the model are simultaneously zero and count R^2 (percent correctly specified) show that the model fits the data well and reliable.

Table 5

Logit Results for Determinants of WTP

WTP	Coef.	Robust Std.Err.	Odds Ratio	P-value
BID	-9.39	2.397979	.0000835	0.000
AGE	-0.075	.0295374	.9280847	0.012
INCOME	0.001	.0006122	1.001372	0.025
HHSIZE	0.051	.1152091	1.052718	0.656
GENDER	-0.343	.5359362	.7096068	0.522
SHELTER	1.010	.7035542	2.745412	0.151
EDUCATION	-0.181	.5702429	1.198132	0.751
SOURCE	1.582	.5279431	4.866893	0.003
_cons	8.844	2.510485	5784.61	0.001
N	*201*	*Pseudo* R^2	*0.5027*	
LR chi2(8)	*97.988*	*Count* R^2	*0.940*	
Prob > chi2	*0.0000*			

Once the model adequacy/model fit is tested, the next step is to test whether the individual variables included in the model are statistically significant and look into their impact on the WTP.

The variable consistent with a priori expectations is monthly income of the household. It is statistically significant at 1% and has the expected positive sign. This result is in line with the economic theory, which states that an individual/household demand for a particular commodity depends on his/her income, and that income and quantity demanded are positively related if the commodity is normal good. The result shows those higher income households are willing to pay more for an improved water service than lower income households. The result is also consistent with other studies done in similar areas both in Ethiopia and other developing countries. Zelalem and Fekadu (2012), Olanrewaju and Omonona (2012) and Gidey and Zeleke (2015) also found the same result.

The coefficient of age of the respondent, AGE, is negatively related to the willingness to pay for improved water supply services and is statistically significant at 5% significance level which implies that the likelihood of paying for improved water supply services falls as respondents' age increases. This may be due to the fact that the old people who have adapted themselves to the old water supply service and system have low preference and less willing to pay for improved water supply service as compared to their younger counterparts. Moreover, the result agrees with Gidey and Zeleke (2015) who found that old peoples fear to invest on projects which their returns are expected after long term.

Sex of the respondent, GENDER, is statistically insignificant which shows the absence of significant difference between males and females in willingness to pay for the improved water supply. This may be due to the fact that the water vendors provide door to door service,

especially for those households whose source of water are not from pipe.
The main source of water for the household (SOURCE) is statistically significant at 1% level of significance and its impact on WTP is negative. The result shows that those households who get water from pipe are less willing to pay for the improved water supply service as compared to household who use water from other source. This is for the reason that quality of water obtained from pipe is better than other water sources relatively. Thus, risk of water related diseases is low if the source is pipe implying that households obtaining water from other source other than pipe have more preferences and willing to pay for the improved water supply services.
Family size has positive sign and statistically significant at 1% level of significance. The result shows that remaining other thing constant if the number of family size increases, the probability of households' willingness to pay for the improved water service also increases.
Shelter and educational status has no significant effect on the willingness to pay for improved water supply service. Moreover, logit model reporting odds ratio was estimated to know the magnitude of impact of each explanatory variable on the WTP.
One objective of estimating the logit model is to calculate the mean willingness to pay for improved water supply by running a regression of the binary choice variable on the bid values. Mean WTP (μ) using the model for the single–bounded logit model format is defined as follows: $\mu = \frac{-\alpha}{\beta}$, where α (intercept) and β (slope) are absolute coefficients estimated from the logit model. Accordingly, the estimated mean willing to pay is 92.06 cents per 20 litres of jerry can. Since the average household daily water consumption was found to be 3.95 jerry cans, the average household's willingness to pay is estimated to be ETB 109.09 per month if the proposed scenario is to be

implemented. This is to mean that the average household's willingness to pay is ETB 1309.08 per year. This is equivalent to 7.2% of average annual income (ETB 18,262.68) of sampled households in which its affordability is sound.

We can also calculate the monthly WTP for the city by multiplying household's monthly WTP (ETB 109.09) by the number of households of the city. Given the current population of Jigjiga city which is 199,756 (CSA, 2012), with an average family size of 4.85 (in the sample), the number of households is about 41186.8. The household's average WTP for the city is about ETB 4,493,068.4 per month.

Conclusion and Policy Implications

Inspired by the premise that demand driven strategy is important during water project design as opposed to supply oriented, the study estimated households' WTP for improved water service provision and identified its determinants in Jigjiga town. The study used primary data obtained from a contingent valuation survey of 210 households in the town. The elicitation method used was a close ended single-bounded method, and we administered the survey using an in-person interview.

This paper has analyzed the determinants of households' willingness to pay for improved water supply in Jigjiga town. The study used primary data obtained from 210 households in Jigjiga town. A single bound, close ended elicitation format was used.

To analyze the survey responses obtained from contingent valuation method was employed in which both descriptive and econometric analysis were used. The study revealed that majority, about 76% of households, get water from non-piped mainly water vendors while only 24% of the households get from piped sources. Of a total surveyed households, about 84.58% of them rated the current water quality in the town as poor. Only 6.97 % percent of the respondents have rated the current water quality in town as good and only 0.5% of them has the perception that the current water supply is good in terms of quantity. Regarding the quantity of water supply, 83.09% of the respondents ranked as poor while only one respondent, 0.5%, has the perception of the current water supply in the town is good. Moreover, majority of the surveyed households (81.49%) do not use any water purification method to clean water they get from none-pipe sources. Due to this fact, 58.71% of the surveyed households reported that the family members have suffered from water borne diseases, mainly diarrhea and typhoid.

The descriptive analysis of the household survey shows that the existing water tariff rate is expensive. Out of the households who get water from pipe, 79.59%, 4.08% and 16.33% of the reported the existing water tariff is expensive, affordable and cheap respectively. Furthermore, households who get water from non-pipe sources are currently paying 4.5 ETB per 20 liters on average which is expensive.

The results of the logit regression showed that age of the respondent, monthly income of the household, family size of the household, bid value and source of water are significant variables that explain willingness to pay for improved water service. WTP is positively affected by household income, implying that higher income households are willing to pay more than lower income households. The relationship between bid value and the WTP is negative which is according to the law of demand. Accordingly, as the bid value rises the WTP falls. Household size positively affects the WTP for improved water service. The household with large family size is more likely to pay for the improved water service that family with small family size. Moreover, source of water for the household has positive impact on the willingness to pay for improved water service. Household who gets water from other source other that pipe are more willing to pay for the improved water supply as compared to family whose source of water is pipe.

On the other hand, sex of the respondent, educational status of the respondent and shelter (whether the family owns house or rented) which is the proxy for wealth are not determining factor for the willingness to pay for the improved water supply in the town.

The mean WTP is found to be 94 cents per jerry can (20 litres container) from single-bounded logit model estimates.

Quality of the existing piped water service is not good and the existing water supply is in short of the existing demand for water. The implication here is that the regional government should provide improved water service which solves both quality of service quantity and coverage of water supply.

While designing the policies and projects related to the improved water service, the government should consider the socio-economic characteristics of the households such as age, income, educational status, source of water etc. as they significantly affect the WTP. Moreover, the socio-economic characteristics of the household plays crucial role in designing demand driven strategy during water project as opposed to supply oriented.

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