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Economic Valuation of Improved Solid Waste Management in Eldoret Municipality

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Abstract
Due to high rates of population growth and increasing household disposable incomes Eldoret town is facing enormous solid waste generation. Yet solid waste management is a public good that may not be optimally provided under perfectly competitive market conditions due to indivisibility and non-excludability in consumption. Most attempts at solving waste problems in Kenya have focused on supply-side of waste disposal and collection which have not succeeded, but this paper suggest the use of demand-oriented valuation. The study analyses economic value of improved solid waste management in Eldoret municipality based on 199 sampled household respondents. A contingent valuation method (CVM) and multiple regression techniques are used to identify the determinants of willingness to pay (WTP) values. Results show that residents are WTP on average Kshs 363 per month for solid waste management improvements. This indicates peoples' desire for change in improved waste management. The WTP are influenced by income, education, age and total disposal methods available to the household. The WTP estimates can be used by urban planners and administrators to determine the socially optimal charges for solid waste services and use it as a tool to estimate taxable revenues.

Keywords: contingent valuation, willingness to pay, household waste management

INTRODUCTION

Cities in developing countries, like Kenya, are facing increasing generation of waste and accompanying problems associated with waste collection and disposal (Begum et al., 2007). This is mainly due to increase in population growth and rapid economic expansion. The problem of solid waste in Eldoret municipality emanates from high waste generation, lack of disposal sites, inadequate waste collection by local authorities, and household/individual poor disposal habits (Banga et al., 2011). Uncontained generation of solid waste and disposal, coupled with poor collection services, poses a great threat to environmental quality and human health (Jin et al., 2006; Afroz et al., 2009). In order to clean up Eldoret of waste the local authorities have used the strategy of collecting what has been deposited by the urban dwellers without a viable measure of inhibiting the deposition. In Eldoret municipality general revenues have been used to pay for the collection and disposal of waste. This has proved extremely inefficient as evidenced by the continued piling up of waste heaps in almost every street corner. But with improvement of welfare the negative aspects of waste disposal and collection have made residents demand better environmental quality.

Solid waste management is generally a public good that cannot be optimally provided under the present market conditions since the commodity is characterised by not-competing consumption and non-excludability. Solid waste collection and disposal services require a different market situation from the ordinary market pricing mechanism to achieve optimal resource allocation. This because the environmental services are often under-priced or non-priced (Anaman and Jair, 2000; Jin et al., 2006) and hence to maximize social welfare levels resources must be allocated in a way to bring about most beneficial changes. It is therefore important to come up with a technique that can evaluate the environmental magnitude important for use in decision making. Stated preference techniques are the primary means of valuing non-market benefits (Jin et al., 2006) and the commonly used non-market valuation technique is the contingent valuation method (Mitchell and Carson, 1998; Carson et al., 2001; Jin et al., 2006). Contingent valuation method (CVM) has been used to estimate the value people place on environmental commodities by creating hypothetical market scenarios to elicit their willingness to pay for them (or willingness to accept compensation).

Ad hoc studies in solid waste management in Kenya concentrate more on planning and resource allocation (for example Kibwage, 1996; Nyakaana, 1996; Ombura, 1997) which are descriptive in nature. Most attempts to solve waste problems in Kenya focus on supply-side of waste disposal and collection, which have not been successful. The result is inefficiency of present policy and methods evidenced by continued

piling of solid wastes. This paper suggests the use of demand-oriented valuation to waste management. Furthermore, there is limited literature on economic valuation of improved management on solid waste.

There are no adequate data on the pricing of solid waste disposal and collection services as a normal economic commodity. This study attempts to bridge the existing knowledge gap. Economic valuation of municipal solid waste (MSW) can assist link economic policies to environmental outcomes; give decision makers a summary of urban environmental problems; and assist in formulation of policies on solid waste management. The limitation to this research is that the valuation is based on hypothetical market instead of actual market pricing, which is the general drawback of contingent valuation method. The objective of this paper is threefold; first to analyse the economic value of having an improved management to the community in order to bring to attention the magnitude of the problem. Second is to evaluate the use of value in Eldoret municipal decision-making process to determine the cost of waste management. Third, is to estimate economic implications of solid waste as an economic good.

MATERIALS AND METHODS

Empirical Design and Data Collection

The questionnaire used in this study was based on focus group discussions and pilot survey of 30 respondents of the six residential estates in Eldoret municipality. Focus group discussions and key informants were conducted to explore various viewpoints and to provide relevant information on solid waste disposal and collection. The findings of the discussion groups assisted in the development of draft questionnaire that was used in the pilot survey. The pre-test was conducted in order to uncover any challenges in interpretation of the questions and results used in identifying the bid vector that must be included in the final development of the contingent valuation questionnaire.

Survey Design and Sampling Method

In this study, direct face-to-face interviews were conducted as it has been shown to be the most reliable in contingent valuation studies (Carson et al., 1996; Alfroz et al., 2011). In order to get samples representative of the population a simple stratified random sampling technique was used based upon approaches described by Czaja and Blair (1996) and Sarantakos (1998) to select a sample of 199 households. Stratified sample was divided into two strata: residential estates and households. The estates were sampled according to their income levels. This is justified in the sense that waste disposal and collection services are biased toward the affluent estates in terms of frequency of waste collection and availability of disposal bins/bags. The poorer estates generate the highest levels of waste due to bigger family sizes. Residential are both; privately developed and municipal council estates. Estates randomly sampled are representative of Eldoret municipality thus six out of thirty two estates were selected. These are; Langas, Kimumu, Kapsoya, Bacon, Macharia and Elgon View. The household was the unit of analysis and respondents' household head or spouse. This is because waste is collected and paid for at the household level (Afroz et al., 2011). The survey was conducted from October 2010 to April 2012.

Questionnaire Design

Questionnaire survey was the main instrument for the collection of household data in this study. The first section included survey issues relating forms of solid waste generated by Eldoret households, perceptions and awareness of impacts of wastes, current issues pertaining waste collection and disposal and challenges associated management of solid wastes in Eldoret municipality. The second section involved getting information on the household socio-economic characteristics. This part of the questionnaire design was used to generate data that may influence the household WTP. Some of the socio-economic characteristics include house ownership, income, household size, age, total available methods of waste disposal, sex and education.

The contingent valuation survey is the third section of the questionnaire design. The purpose of this section was to obtain an estimate of the value of improvements in solid waste management in Eldoret. The methods generally used in estimating willingness to pay (WTP) include continuous CVM, represented by open-ended questions, and discrete CVM (represented by dichotomous choice question) (Zhen et al., 2011). This study used the continuous CVM to elicit the willingness to pay values. In this procedure the respondents are free to answer the open-ended questions by indicating the maximum amount they are willing to pay (Song et al., 2012).

Contingent Market Scenario

In order to elicit willingness to values for improved management of solid waste in the CVM survey a hypothetical market scenario was described. A description of the commodity, which is 'improved solid waste management', was made to the household respondent. "Eldoret municipality solid waste management company" was presented as the hypothetical institution responsible for the service delivery. The funds were to enable the setting up of a project for the service and that all the residents of Eldoret expected to contribute to and influence the management of the fund. The impacts of the project were explained to the interviewee.

The information included the fact that service would start soon, and that the good would be made available for use. In defining the payment vehicle respondents were asked to select either the service charge or water-bill as the preferred tool of payment. The respondents were asked whether they were willing to pay anything in terms of additional flat water bill or service charge per month for the improved solid waste management. The flat-water bill has the dustbin charge within the monthly bill.

After understanding the contingent market respondents were first asked if they would be willing to pay anything for the improvement scenario presented. If the interviewees said 'yes' to the participating question, then they were asked to place a maximum monthly monetary value for improvement of solid management. But those unwilling to participate were asked to give a reason for their response. The reasons for the "no" responses were classified as: "Not able to pay for improved solid waste management", "Not willing to place a shilling value on the exercise", "Not well informed about it", "Simply don't want to participate in the survey" and "Better waste management is of no value". Each response was probed to understand the reasons behind each preference category.

The validity of WTP bids were assessed by incorporating validation questions into the questionnaire, apart from socio-economic data, that can be used to examine the effects of the theoretical determinants of the explanatory variables in the commodity demand function and the WTP valuation (Urama et al., 2006; Lienhoop et al., 2007; Bett et al., 2009). For example, "How much more money on top of what you have mentioned would you be willing to contribute to the fund if you if you were sure of the success of the project or involved in decision-making process?"

Techniques of Analysis

Descriptive statistics were computed in order to explain the mean, median, standard deviation, ranges of the data. The frequency distributions in percentages was analysed to reveal the respondents selection of the different characteristic options such as ranking of the gravity of waste disposal problem, ranking of various management options for domestic solid waste and reasons for not willing to pay for improved management of solid waste in Eldoret municipality.

Some selected variables were used in the multivariate analysis. In this, the relationship between the dependent variable, willingness to pay, and the explanatory variables were examined where an Ordinary Least Squares (OLS) regression was used for estimating the parameters in the multiple regression model. It is the process of testing the effects of income, age, sex and other socio-economic determinants of the demand for household waste improvement on the WTP.

Statistical tests for the significance between and among variables are t-test and ANOVA tests. The significance of difference between pairs of means of continuous variables used t-tests for equality of means (Murad et al., 2007) while ANOVA test were applied in the case of significance of more than two means. Correlation analysis was used for testing of multi-collinearity among the explanatory variables. Adjusted R^2 values and F tests have been tested for examining the theoretical validity of the CVM bids. The WTP values were then aggregated, whereby the mean bid or bids were converted to a population total value figure. It is assumed the households whose utility were significantly affected by the solid waste disposal revealed a higher bid.

THEORETICAL MODEL

The concept of economic valuation is founded on welfare economics (Nijkamp et al., 2008) where people are motivated by utility maximization of goods and services. The economic valuation of solid waste is based on the assumption that the management improvements is a normal good (majority of literature - including Altaf and Deshazo, 1996; Zain, 1999; Jin et al., 2006; Fonta et al., 2008; Banga et al., 2011 – have concluded that solid waste management service is a normal economic good) which can be expressed as arguments in a well-behaved utility functions (Perman et al., 2003). In economic theory the price of good, prices of substitute and complementary goods, the individual's tastes and preference, influence the individual's demand for the commodity. The demand for improvement of domestic solid waste services can be shown in a simple utility function;

$$d = \{d (P, SC, I)\} \quad 1$$

Where d is the utility as expressed in the demand for the commodity

P expresses price of the commodity to be purchased (WTP value)

SC is the consumption of substitute and complementary goods

I show household use of the improvement service

In describing the household decision on whether or not to purchase the improved provision of solid waste management this study used the contingent valuation method. The principal idea underlying this method is that people have preferences for environmental goods and these preferences are hidden, but are capable of translating into monetary units. The demand of waste management improvements, as stated in willingness to pay in the contingent market, can be expressed mathematically as a function of several factors:

$$WTP_{ij}=\beta_0+\beta_1(X_{1i})+\beta_2(X_{2i})+\beta_3(X_{3i})+\beta_4(X_{4i})+\beta_5(X_{5i})+\varepsilon_i \quad 2$$

Where:

WTP_{ij} is WTP valuation of improved solid waste management Kenya Shillings, (X_{1i}) is household income, (X_{2i}) is the educational level of household head (1 indicates primary education, 2 secondary education and 3 college and above education), X_{3i} age, X_{4i} is gender, X_{5i} is total available disposal methods, β_{is} are unknown parameters which are to be estimated and ε_i is the stochastic term. Tests for multi-collinearity showed no major correlation between the explanatory variables.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

In this study, after eliminating missing or inconsistent answers to valuation questions 199 (97%) responses were considered valid representative sample for Eldoret residents' population. Table 3.1 reports the descriptive statistics of the main socio-economic characteristics of the households. The sex distribution of the samples was 48% females and 52% males. The age ranged between 20 years to 61 years and above. The ages between 57 years and above had decreasing frequency. This clearly reflects the urban population patterns, having a higher percentage falling in the middle age group where the majority fall between ages 21 to 30 years. The Table 1.0 below summarises the descriptive characteristics of the households.

Table 1.0: Descriptive statistics of socio-economic characteristics of the households

Variable		Count	Percent
Gender:	Female	96	48.2
	Male		51.8
Age:	20 Years and below	6	3.0
	21-25	50	25.1
	31-35	47	23.6
	36-40	37	18.6
	41 and above	59	29.7
Employment:	Employed in formal office	84	42.1
	Business man/woman	41	20.6
	Farmer	4	2.0
	Employed in informal sector	27	13.6
	Unemployed	43	21.6
Education:	No formal schooling	6	3.0
	Primary school	47	23.6
	Secondary school	77	38.7
	Middle college	51	25.6
	Undergraduate	13	6.5
	Post-graduate	5	2.7
Income (Ksh):	800-2,000	34	17.1
	2,001-5,000	49	24.6
	5,001-7,000	30	15.0
	7,001-15,000	47	23.6
	15,001-20,000	19	9.6
	20,001-30,000	11	5.5
	30,001 and above	9	4.5
House ownership:	Personal	38	19.1
	Rented	161	80.9

Income generated by most Eldoret residents was either through employment in the formal office or in business transactions. Households involved in income generating activities are 78.4% while 21.6% respondents are dependent on income generated by other household members. Majority (97%) of respondents has had formal education. Of these 64.3% completed their formal education either in high school or middle college training. Majority (80.9%) of the Eldoret town residents rented the houses they occupied. Hence, expenditure on house rents is high in Eldoret affecting disposable income and therefore ability of households to internalise environmental improvement costs. Most (63.3%) of the households has five and more members. This implies high generation of wastes.

Solid Waste Management at Household level

Most Eldoret respondents (98%) generate wastes in form of glass, plastics, paper, packaging waste and food products. On average only 37% of residents release polymers and scrape materials as household wastes while wooden materials and batteries are generated by about 70 of the respondents. Majority of the Eldoret dwellers are male (52%) who generally work on wooden business and deal with scrape materials and car batteries. This may be due to the fact that the men leave their wives in rural homes while some are not married. Table 1.1 below gives a summary.

Table 1.1: Types of waste generated and frequency of household generating the wastes.

Type of waste generated	**Distribution Frequency**	
	Count	Percentage
Glass	190	95
Plastics	198	99
Paper	194	97
Metallic materials	151	76
Batteries	146	73
Packaging materials	198	99
Wood products	133	67
Polymers	69	35
Scrape tyres	77	37
Foods	198	99

Notes: n = 199

The percentages indicate the proportion of the population interviewed that revealed the type of waste generated. Scrape tyres, and polymers and rubber bands (carpet fibres, sanitary products) are generated by 39% and 35% of the respondents respectively. On average 76% of respondents release metallic materials (like chocolate containers), batteries (73%) and wooden materials (67%) of household wastes. Majority (81%) of the Eldoret town residents rented the houses they occupied which means expenditure on house rents would affect their ability to internalise environmental improvement costs by designing household wastes reductions mechanisms. Also with most (58%) households with more than five members then the level of wastes

generated are high. This indicates a high rate of dependency in Eldoret municipality.

About 48% of the households are faced with long distance to waste collection site as an obstacle to the disposal of waste. Waste collection bins are sporadically and sparingly located by Eldoret Municipal Council (EMC) and hence, people throw wastes not far away from their compounds. Hence distance is a great disincentive to the proper disposal of waste products. On the other hand, 83% of those interviewed experience the problem of illegal waste dumping around their compounds. This is because of poor management of wastes by Eldoret municipal authorities. As a result of long distance to collection site house-helps and children dump wastes near their neighbours' compounds. Winds and animals are other agents that contribute to dispersal of waste materials around people's compounds. Over 57% of residents attribute the challenge of household waste disposal to the inability of EMC to collect the wastes frequently.

Solid Waste Management in Eldoret Municipality

From the Table 1.2 below 84% of the respondent's reuse the waste materials at home while 76% burn the wastes. Plastic containers are more reused especially the big ones with handles. The plastics are also used as fuel in some households. Other methods of waste disposal include use of open pits (49% of households) and throwing to empty space (47%). The reason for throwing to any empty space is because of long distance to collection places, lack of collection cans and inability of the municipality to pick the wastes in the bins. The empty spaces were mostly private undeveloped plots. About 38% of the residents use collection cans. These collection cans can be available but the residents don't use of them because they are normally filled up. The household who use pit latrines for depositing materials like glasses and sanitary products are 42% while only 5% sale wastes for recycling.

Table 1.2: Methods of dealing with household solid wastes

Methods	Count	Percentage
Throw to empty space	93	47
Use collection cans	75	47
Burn	151	76
Sale for recycling	9	5
Reuse at home	167	84
Take to latrines	83	42
Dig open pits	98	49

Note: The count indicates the total respondents that use particular method. They normally use more than one method.

The challenge of solid waste disposal can be partially solved when residents managed well at the household level so that responsibility of the municipality is the storage and disposal (EMC, personal communication, 2011).

ECONOMIC VALUATION OF SOLID WASTE

The Contingent Valuation Model and Willingness to Pay

In presenting contingent market, the respondents were informed that some experts argue that the problem of domestic solid waste can only be solved when the local authorities are able to finance the appropriate collection and disposal of waste and develop ways of containing the problem. They were also informed that the new project would only succeed if he/she contributed in monetary terms for the household solid waste management and that the project was to start soon. When the respondents were presented with this market situation many wanted elaboration of this system and assurance that it would not be corrupted due to poor not trust on the existing municipality management. After understanding the market system presented majority of the respondents were willing to participate in the survey and those not willing to participate were asked to give a reason.

Willingness to Pay Response

The survey asked the respondents on their willingness to pay (WTP) anything (financially) in terms of additional flat water bill or service charge per month. The flat-water bill is the dustbin charge within the monthly bill. On the other hand, service charge is a tax for the provision of sanitary services by the municipal council. Most (80%) of the respondents are willing to pay some amount of money in the contingent market representing a significant number of respondents who valued the benefits of improved management of solid waste in Eldoret municipality (Table 3.3). Then, a validation question was asked to investigate validity of household's WTP bids (Shaikh et al., 2007) and results showed that 65% of the households are not ready to contribute above what they bided. This indicates that over half of the respondents are certain on their bids, while 35% of them expressed WTP response uncertainty (that is, they are WTP more than their maximum bids when prodded further and hence expressing uncertainty on their initial maximum WTP amounts). Therefore, 20% of the respondents are not willing to pay anything. Among the 39 residents who were not willing to pay anything 36 gave a reason while three were not able to give any reason. Eight (8%) of the 160 respondents who were WTP gave a protest bid. Most (99%) of the sample population WTP showed the payment tool as either water bill or service charge and the rest did not indicate the payment vehicle. Table 1.3 below shows the willingness to pay response for improved management of solid waste.

Table 1.3: Willingness to pay responses and reasons for not WTP

WTP Response	Households
	Count (%age)
Willing to Pay:	160 (80)
Not Willing to Pay:	39 (20)
Reason:	
1. Not able to pay	8 (22)
2. Not willing to place a Shilling value	0 (0)
3. Not well informed about it	4 (11)
4. Don't want to participate in the survey	4 (11)
5. Solid waste management is of no value	20 (56)
Total	**36**
Protest bids	**3** (7)

Out of those who were not WTP (20%) for improved waste collection and disposal services were probed further to investigate the reason for their responses. The 39 households (of 199) 36 gave a reason as to why they are unwilling to pay for the improved environmental service. About 22% of these indicated that the reason for not WTP was because of lack of ability to pay while 4% would not want to participate in the survey. The households who were not WTP because solid waste management was of no value (56% of those not WTP) indicated that better waste collection and disposal services are of no direct economic benefit. The main reason they gave for rejecting the hypothetical market was that it was municipality's (and by extension, government) responsibility to provide improved solid waste management service.

The Payment Vehicle

The respondents willing to pay were asked to indicate the payment vehicle between monthly water bill and service charge (deducted automatically by employers) they prefer for contributing towards the household solid waste management scheme. Among the 160 people who were willing to pay one would not show the tool of payment. The respondents who preferred the water bill as means of payment were 39 (25%), and those who chose service charge constitute 121 (75 %) of the respondents. This shows that the residents are not satisfied with the way the money contributed for waste management within water bill is managed. For this reason they would prefer another means of payment.

The Maximum WTP Amounts

The respondents were asked to state the maximum amount of additional flat-water bill / service charge per month they were willing to pay to address the household solid waste problem. The lowest amount WTP was Ksh.5 and the highest was Kshs 2,500. The amounts with highest frequencies were Kshs 250 and Kshs 500 with 44 and 34 respondents respectively. Also eighteen respondents were WTP Kshs 100 and eleven were WTP Kshs 1000. The rest of the amounts had ten or less respondents. Table 1.4 below illustrates the findings.

Table 1.4: Maximum Willingness to Pay and Frequency Distribution

Maximum Willingness to Pay Amounts	Bid (Sh.)	lumber of espondents	Total (Sh.) Amount
Maximum WTP (Sh.):			
	5	1	5
	50	10	500
	100	18	1800
	125	1	125
	150	9	1350
	175	1	175
	200	11	2200
	225	1	225
	250	44	11000
	300	7	2100
	350	3	1050
	400	3	1200
	500	34	17000
	750	2	1500
	1000	11	11,000
	1,500	1	1,500
	2,500	2	5,000
Total		**159**	**57,730**

Note: Total amount of WTP = Kshs 363

Hence, the people of Eldoret municipality were willing to pay Ksh. 363 ($4.3 in current exchange rates of Ksh. 85 a dollar) per month for environmental management improvement. This amount shows Eldoret residents' willingness to purchase improved domestic solid waste management as a commodity.

Testing for Theoretical Validity of the CVM Bids

In testing the theoretical validity of CVM bids multivariate regression analyses were performed to check the behaviour of WTP determinants (Mitchel et al., 1989). As expected for the analysis most of the explanatory variables in the demand for improved waste management are statistically significant with the expected signs (Urama et al., 2006). The four significant (p<0.05) predictors for the WTP bids are the maximum willingness income, age, education and total disposal methods available (see Table 3.5 below). Further, as proposed by Urama et al. (2006), OECD (1994) and Mitchel et al. (1989) that the model should have at least a R^2 value that is above 0.15 as adjusted for degree of freedom, the R^2 of the CVM regression model is 0.56. The R^2 means that a null hypothesis that the coefficient on WTP is zero could be rejected in favour of the alternative hypothesis that the coefficient is positive, with a probability of 0.56 making a type I error. In other words, the adjusted R^2 of 0.56 demonstrates that the CVM regression model is good fitting.

This means that the independent variables in the model explain 56% of the variations in change of household willingness to pay for improved solid management services. Therefore, since the

econometric analysis reveals systematic relationship between the explanatory variables and the households' stated WTP as depicted by that most of the signs of estimated coefficients are consistent with theoretical expectations (Begum et al., 2007; Urama et al., 2006), it can be concluded that the CVM was within the theoretical framework. In other words, the stated preference valuation of households' demand for improved provision of waste management in Eldoret municipality is consistent with economic theory

Determinants of Willingness to Pay

In estimating the determinants of willingness to pay for improved provision of better solid waste disposal and collection in Eldoret municipality, first regression model is formulated without including the protest bids (invalid responses) and then with insertion of zeros to protest values. This is done to check for the presence of sample selection bias. The presence of sample selection may affect the validity of the estimates obtained (Banga et al., 2011). Table 1.5 shows that there is no much variance between the two regressions models in terms and direction of parameters relations and level of degrees significant difference. Since there is no significant difference in the characteristics of the two samples of analysis then it may not be necessary to use a sample selection model and hence, the estimates can be said to be reliable for policy formulation and planning.

Table 1.5: Ordinary Least Squares Regression on unadjusted and adjusted Maximum Willingness to Pay for Improved Household Solid Waste Management

Regression before inserting zeros to the protest bids values (unadjusted WTP)				
Variable	Coefficient	Stand. Error	t-value	Significance
Constant	75.657	35.136	2.153	0.033
Sex	1.496	12.097	0.124	0.902
Age	-2.365	3.891	-2.008	0.039**
Education	12.009	7.244	2.658	0.024*
Income	23.518	4.383	5.366	0.000*
Totdm	-9.128	6.247	-1.991	0.042**
Adjusted R^2=0.586				
Regression after inserting zeros to the protest bids values (adjusted WTP)				
Sex	1.914	10.338	0.185	0.853
Age	-6.365	2.924	-2.177	0.031**
Education	11.162	5.924	2.872	0.028*
Income	20.661	3.649	5.662	0.000*
Totdm	-2.691	5.356	-2.002	0.036**
Adjusted R^2=0. 551				

Notes: 1. Stand.Error - stands for standard error and Totdm- indicates Total disposal methods available to household.
2. * Significant at p<0.05, and ** Significant at p<0.01

As expected the household education has a positive and significant effect on willingness to pay. The positive coefficient of education suggests that the educated are WTP than the less educated. This relationship is consistent with economic theory as highly educated households are more likely to be aware about health implications of unclean environment. Income was expected to have a strong influence on the demand for environmental quality and hence the major determinant of the willingness to pay value. The reason for this theoretical basis is that the contingent valuation study is based on how much people are willing to put a money value on improved solid waste management and this ability is influenced by income. The Eldoret residents expressed a positive and significant relationship between household income and the willingness to pay. The findings on education and income are corroborated by others like Whittington et al. (1993), Munisinghe et al. (1993), McConnel (1997) Murad et al. (2007), Afroz et al. (2009) and Banga et al. (2011).

The age of the household head showed negative and significant (p<0.01) effect on willingness to pay. This means that the more aged are less willing to pay than the younger people. This may be because the aged are not ready to invest in environmental improvement. Also, at an older age environmental issues may not carry a big weight to them as compared to the young who are likely to be more sensitive to the environmental quality. This result is consistent with other studies (Afroz et al., 2011; Banga et al., 2011; Danso et al., 2006). This study found an inverse relationship between the disposal methods available to the household and the willingness to pay (p<0.01). The reason for this may be that when there are no other alternatives (or alternatives are few) for waste disposal, residents are willing to pay more for waste management than when avenues for disposal are available.

Sex of the respondent had a positive effect on willingness to pay for household solid waste management. The positive value shows that males are more willing to pay for solid waste management than the females. In the analysis the female carried the weight of 1 while male 2. The reason for the higher willingness to pay among men can be attributed to the fact that they have more say in monetary expenditure in many Kenyan households. Many female respondents would give a willingness to pay value that would be accepted by their husbands. Single women tend to be free in placing a monetary value to the environmental improvement programme.

Therefore the household member's authority over monetary spending seems to influence the willingness to pay patterns. Secondly, the male respondents are more concerned about their visitor's perception of the environmental conditions around their compounds. But the difference between the male and female respondents was not statistically significant as shown by the t- statistic.

Testing for Multicollinearity among Explanatory Variables

A correlation matrix of the independent variables is analysed to test for the occurrence of multicollinearity. In the willingness to pay model the explanatory variables are income, sex, total disposal methods, education and age. Except for income which has an almost significant correlation with education (0.56), using Pearson correlation analysis (p<0.05), all other variables are not correlated with each other (Table 3.5 gives the details). The results of this analysis show that there is no significant correlation among the independent variables that is exceeding 0.70 (Begum et al., 2007 argues that a multiple regression model that have no two independent variables in excess of 0.70 show the best in no multicollinearity). This means that the estimating parameters are not highly related to each other. Table 1.6 shows correlation matrix between explanatory variables.

Table 1.6: Correlation matrix between independent variables

Pearson Correlation Coefficients					
	Income	Sex	Totdm	Educ	Age
Income	1.00	0.152 (0.015)	-0.191 (0.003)	0.562	0.265
Sex	0.152 (0.015)	1.00	0.012 (0.436)	0.370	0.376
Totdm	-0.191 (0.003)	0.012 (0.436)	1.00	-0.287	0.047 (0.256)
Educ	0.562	0.370	-0.287	1.00	0.047 (0.044)
Age	0.265	0.376	0.047 (0.256)	0.047 (0.044)	1.00

Notes: The parenthesis shows the probability

The variables 'Totdm' means total disposal methods while 'Educ' indicates education level.

CONCLUSION AND POLICY RECOMMENDATIONS

The findings show that most (80%) respondents are willing to pay for improved environmental services in Eldoret Municipality and on average are willing to pay Kshs 363 ($4.3 in current exchange rates of Kshs 85 a dollar) per month. This means that Eldoret residents consider improvements in solid waste management as an economic commodity. It also indicates their desire for change in management of waste. The econometric analysis reveals that the relationship between the explanatory variables and the households' stated WTP are consistent with theoretical expectations. In other words, the economic valuation of improved provision of waste management is consistent with economic theory.

Generally, the results of the determinants of WTP compare favourably with WTP analyses in other developing countries. As expected the household education, income had a positive and significant effect on demand for better environmental quality. The age of the household head had a negative and significant (p<0.01) effect on willingness to pay. Gender, although has positive effect, does not significantly influence decisions on willingness to pay for household solid waste management. The positive relationship indicates that males are more willing to pay for solid waste management than the females.

The reason for the higher willingness to pay among men can be attributed to the fact that they have more say in monetary expenditure in many Kenyan households. Hence, contingent valuation studies can statistically be carried out in cities in developing countries and achieve reasonable results. CVM is important in its ability to estimate the statistical models, which can be used by urban planners and administrators to determine the optimal charges for solid waste management and also act as a tool of estimating taxable revenues. On average a tax of up to Ksh. 383 per month (corresponding to average WTP per month) for environmental management is acceptable to the majority of Eldoret residents. This is because the average maximum WTP, in the study, was higher (at Sh. 363) than the present fee, which is Kshs 200. Hence increased fees would result in better solid waste management without affecting the residents' economic status.

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