

Determinants of Willingness to Pay for Solid Waste Management in Kampala City

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Abstract: This research studies the willingness to pay for improved solid waste management in Kampala city. A multi stage sampling technique was employed to select one hundred eighty two households from the study area. A dichotomous choice contingent valuation technique was used to elicit households' willingness to pay for improvement in management of their solid waste. We used a logistic equation model to establish the determinants of willingness to pay for solid waste management. The logistic regression estimates, revealed that the age of the household head is negatively associated with the willingness to pay for solid waste management. Other variables were not significantly associated with the willingness to pay for improved solid waste management. The results of this study suggest there is little chance of success if solid waste collection service charges are introduced.

Key words: Age, solid waste management, willingness to pay

INTRODUCTION

This paper studies the willingness to pay for improved solid waste management in Kampala city. The management of solid waste involves storage at the source, collection, transportation and final disposal of the refuse. With increased urbanization, there is a growing interest in solid waste management in urban areas among researchers and policy makers. With the increasing urbanization, rising standards of living and rapid development associated with population growth, solid and liquid waste generation by industries and domestic activities has more than doubled in Kampala since 1990 according to Kampala district development plan (2006/07- 2008-09). It is estimated that out of 1600 tones of solid waste generated per day in Kampala, 45-50% of the tones rots uncollected.

Poor solid waste handling is threatening the lives of Kampala residents. To improve this pressing problem the government and other stakeholders have to put maximum effort. The problem is usually inadequate budget compared to solid waste generation in Kampala city. In line with this, it is very important and timely to look for the possibility of cost sharing by households, and for this we need to analyze the demand side for improved solid waste management. Therefore, this study is designed to generate demand side information, which is vital for the planning process

There is an extensive literature on the willingness to pay for solid waste management. Some studies have shown that the willingness to pay for solid waste management is associated with income, education,

quantity of waste generated, household size, and age (Alta and Dehazo, 1996). Previous studies have shown that low-income consumers are willing to pay for services they want (Cairncross, 1990; World Bank, 1995). However, little is known about the determinants of willingness to pay for solid waste management in Ugandan urban areas. The main purpose of this study is to fill in the gap by applying the dichotomous choice Contingent Valuation Method (CVM). The CVM technique is superior to other valuation methods because it is able to capture use and non-use values. Other valuation methods like Hedonic Pricing and Travel Cost method tend to underestimate satisfaction derived from services rendered since they measure use values only. As Freeman (1993) noted non-use values could be larger in some cases, and, as such, the use of measurement techniques that capture only use values underestimates the total derived values. The other reason for using CVM is its ease of data collection and requirement compared to other valuation methods.

The CVM technique however suffers from one major drawback despite its ability to measure total economic values. The hypothetical nature of the questions used in CVM surveys may pose problems since respondents may have little incentive to provide information on their true willingness to pay. Despite this limitation which is well acknowledged in the literature, the results of this study reveal that the age of the household head is associated with the willingness to pay for improved solid waste management. However, household expenditure, marital status, sex, weight of waste generated, size of the household, and education level of the household head

were not associated with the willingness to pay for solid waste management. The result of this study suggests there is little chance of success if solid waste collection service charges are introduced.

Specifically, one question this study also tends to answer is if the factors that influence household's willingness to pay for improved solid waste management within Kampala city can be identified. The study was based on the premise that households in Kampala are willing to pay for improved solid waste management. Specifically the study expected that education, income, age, and family size are associated with the willingness to pay for solid waste management.

MATERIALS AND METHODS

Data collection and sampling technique: The study was carried out in 2009 at Kampala city. Kampala is the capital city of Uganda. The data were collected with the use of structured questionnaires. This study has made a considerable effort to make the sample as representative as possible. A multistage sampling technique was employed. The first stage involved the use of purposive sampling techniques whereby two divisions were selected, i.e., Nakawa and Rubaga division. The second stage involved stratifying the two divisions of Kampala city into two income groups. This step was very important but very difficult to do, because willingness to pay for improved solid waste management involves demand estimation, and its main determinant is expected to be income. The divisions in Kampala were roughly divided into two income groups using the quality of housing in the absence of any other formal way of stratification and acknowledges the problems of using proxies and unpublished information. The systematic sampling technique was used for the third stage whereby every 5th building in both areas was sampled. A total of 182 households were sampled from both areas; 86 households from the Rubaga division while 96 households were sampled from the Nakawa division. The study would have benefited from higher sample size but due to inadequate funding the sample size could not be increased.

Model specification: The logit (double log) linear regression model was used to obtain the willingness to pay of the households for improved waste management. The logit linear model which is based on the cumulative probability function was adopted because of its ability to deal with a dichotomous dependent variable and a well established theoretical background. Logistic regression is a uni and multivariate technique which allows for estimating the probability that an event will occur or not through prediction of a binary dependent outcome from a set of independent variables. To identify the factors influencing willingness to pay for improved waste

management by households, the household responses to the maximum willingness to pay question was regressed against socioeconomic characteristics of the household. The logistic (double log) linear regression function for this study can be specified as follows:

$$\ln(Y) = 1 / 1 + \exp^{\ln z} \quad (1)$$

where, Y = responses of household maximum WTP

$$\ln(Z) = \beta_0 + \sum_{i=1}^n \beta_i X_i \quad (2)$$

Where,

- X1 = Age in years
- X2 = Educational level measured by number of years spent in the school
- X3 = Marital status (dummy variable)
- X4 = Household size
- X5 = Sex of the household head
- X5 = Household expenditure
- X6 = Weight of accumulated solid waste

Monthly money expenditure of the household enters the model as a proxy of income. There is a general agreement in environmental economics literature on the positive relationship between income and demand for improvement in environmental quality. Therefore, we expect income to affect willingness to pay and its amount positively and significantly. Sex is a dummy variable which takes the value of 1 if the respondent is female; 0 otherwise. This study expects female respondents to be more willing to pay waste management than men, since traditionally it is the role of women to clean the house and dispose the waste. Age of the respondent is expected to affect willingness to pay for waste management negatively. This is because old people may consider waste collection, as government's responsibility and could be less willing to pay for it. While the younger generation might be more familiar with cost sharing like for education and could be more willing to pay. The education of the respondent is taken to capture the level of understanding of the respondent about the desirability of proper management of solid waste. It is hypothesized that the higher the level of education the more the respondent would appreciate the consequence of mishandling solid waste and the more the value the individual would give in order to avoid the risk of being a victim of unclean environment. Education is measured as the number of years spent in school. The marital status of the respondent being single or not is expected to influence the value the individual attaches to a proposed change. Marital status is dummy variable taking 1 if the respondent is married; 0 otherwise, and it is expected to have a positive sign. This is due to the fact that married

people are likely to be more responsible to keep the environment clean than single ones because married respondents are likely to have larger family size and hence face higher risks of hygiene associated diseases than those not married. The household size of the household is expected to have a positive effect on willingness to pay. This is due to the fact that the more number of people in the household, the more willing the household will appreciate a clean environment. The quantity of waste generated is measured in kilograms of waste the household generates within a week. It is hypothesized to be positively related with the willingness to pay, since the higher the generation, the more the households faces the challenges of waste disposal and the greater the willingness to pay.

A number of reasons were considered critical in choosing double log version of the regression model over linear and semi-log models. First, the double log regression model enables the presentation of the regression coefficients directly as elasticity estimates (Fasakin, 2000; Canning, 1998; Arimah, 1994; Arimah and Ekeng, 1993). Second, it translates the skewness of the data frequency to a normal one thereby enabling much better estimates of the explanatory variable (Fasakin, 2000). Third, it reduces the occurrence of heteroscedasticity, that is, the variance of the distribution of the residual is uniform or constant for all values of the variables. Fourth, it ensures the stability of and significance of the implied relationship thereby enabling better explanatory power of the coefficient of multiple determinations (Fasakin, 2000; Arimah and Adinnu, 1995).

RESULTS AND DISCUSSION

The estimated results are presented in Table 1. The results showed that respondents level of education, marital status, quantity of waste generated, household size and household expenditure do not significantly influence willingness to pay for improved waste management. This result is in contrast with earlier findings (Alta and Dehazo, 1996; Cairncross, 1990; World Bank, 1995). However, age of respondent as anticipated has a negative and significant effect on willingness to pay. This shows that as people grow old their willingness to pay waste management degenerates. This probably can be the result of older respondents accustomed to free government services in the previous government. But, the younger people are likely to be more familiar to cost sharing like for education, health services etc.

Considering the importance of improved waste management, the relatively weak values of pseudo R-squared is at variance with reality. This result might be due to low level of awareness among households on the global trend in waste management financing which

Table1: Determinants of willingness to pay for improved waste management

Variable	Coefficients	z-values
Constant	- 4.173	- 0.75
Age of the household head	- 0.758	- 1.87*
Household size	- 0.506	- 1.20
Sex of the household head	0.755	1.31
Marital status of the household head	- 0.0339	- 0.11
Education	0.337	1.01
Quantity of waste	0.181	0.91
Household expenditure	0.527	1.12
Pseudo R-squared	0.12	

*: represents significance at 10%

promotes community participation in a bid to achieving sustainability of improved solid waste management. The low pseudo R-squared might also be a result of poverty among households especially among the urban poor who may resent seemingly additional responsibility.

CONCLUSION

This paper uses primary data to analyze the determinants of willingness to pay for improved solid waste management in Uganda. The results of the study show that the demand for improved waste management is only significantly related to the age of the household head. Despite the limitations of the contingent valuation method, which we acknowledge as a limitation of our study, we can conclude that there is little chance of success if solid waste collection service charges are introduced. Attempts must be made to improve willingness to pay for waste management services in the city. To achieve this, the government should concentrate first on awareness campaigns about the consequences of waste mishandling and benefits of payment for proper waste management before building up the commercialization plan for solid waste management in Kampala city.

REFERENCES

- Alta, A.A. and O.J. Deshaz, 1996. Households Demand for improved solid waste management, a case study of Gujarwala Pakistan. *Word Dev.*, 24(5): 857-868.
- Arimah, B.C. and B.E. Ekeng, 1993. Some factors explaining residential water consumption in third world city - The case of Calabar, Nigeria. *J. Water SRT - Aqua*, 42(5): 289-294.
- Arimah, B.C., 1994. The income elasticity of demand in a sub-saharan African housing market - evidence from Ibadan, Nigeria. *Environ. Plan.*, 26: 107-119.
- Arimah, B.C. and F.I. Adinnu, 1995. Market segmentation and the impact of landfills on residential property values: Empirical evidence from an African city. *Neth. J. Hous. Built Environ.*, 10(2): 157-171.

- Cairncross, S., 1990. Water Supply and the Urban Poor. In: Hardoy, J.E., S. Cairncross and D. Satterthwaite (Eds.), *The Poor Die Young: Housing and Health in Third World Cities*. 1st Edn., Earthscan Publications, London, pp: 109-126. ISBN: 13: 9781853830198.
- Canning, D., 1998. A database of world stock of infrastructure, 1950 - 1995. *World Bank Econ. Rev.*, 12(3): 529-547.
- Fasakin, J.O., 2000. Willingness to pay for the services of commercial motorcycle in Akure, Nigeria. *Cities*, 17: 447-452.
- Freeman III, A.M., 1993. *The Measurement of Environmental and Resource Value: Theory and Methods*. Resource for the Future, Washington, DC. ISBN: 1-891853-62-7.
- Rogat, J., 1998. *The Value of Improved Air Quality in Santiago De Chile*. Kompndiet, Gutenberg.
- World Bank, 1995. *Towards Sustainable Management of Water Resources*, World Bank Publications, Washington, ISBN: 13: 978-0821334133.