

Willingness to Pay for Improved Sanitation Services and its Implication on Demand Responsive Approach of BRAC Water, Sanitation and Hygiene Programme

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Abstract

This study aimed to provide some insights into sanitation-related strategies taken by the BRAC Water, Sanitation and Hygiene (WASH) Programme from an economic point of view. The aim of this report included measuring and identifying the factors that influence willingness to pay for improved sanitation services for the households without any latrine facilities in rural Bangladesh. A contingent valuation survey was carried out in four *upazilas* under BRAC WASH programme to determine household willingness to pay and affordability to pay for basic sanitary latrine options. The results indicate that about 80% of the households were willing to pay for improved sanitation services. Of the total households who were interested in paying for sanitary latrine about 92% preferred payment in monthly installments. The mean willingness to pay was found to be Tk. 69 if paid monthly installments and Tk. 825 if paid in single payment. The mean willingness to pay for the overall sample size was found to be within the range of 1-2% of the disposable income of the households. Economic hardship was found to be the major reason for not installing sanitary latrine. Health, cleanliness and prestige were found to be three major motivating factors for installing sanitary latrine. Regression analysis using ordered logit model showed that odds for spending money for improved sanitation services were higher for households with better income, households who believed that unsafe sanitation lead to diseases and households belonging to already intervened programme areas. As programmatic implications, this study suggests that credit facilities along with convenient location of the village sanitation centers are necessary to fulfill sanitation-related targets set by the programme. This study has also established a causal relationship between health awareness and willingness to pay for improved sanitation services. However, it was found that even if all the stated conditions are met, there will be some households who would not be able to pay for their latrines and will need some sort of cash incentive or subsidy.

Introduction

The leaders from all over the world set a target at the UN Millennium Summit 2000 to reduce the proportion of people without access to safe water and sanitation to 50% by 2015. In line with this Millennium Development Goal (MDG) number seven, BRAC with support from the Government of the Netherlands started a five-year project on water, sanitation and hygiene (WASH) in 2006. One of the objectives of this programme is to ensure that 17.6 million people, spread over 150 *upazilas* of Bangladesh, have access to sanitation services that are effectively used, including consistent hygiene practice.

The approaches taken for achieving sanitation-related targets by the programme could be classified into two broad categories. Firstly, The WASH project will motivate people through various awareness-building activities to increase demand for sanitary latrines in its target areas. The underlying hypothesis is that in general there is a lack of awareness for using sanitary latrines and with proper designing and monitoring, the programme can bring about positive changes in rural people's attitude towards sanitation practices. The National Sanitation Strategy (2005) supports such hypothesis and states that demand for sanitation can effectively be generated once people are convinced of the need for sanitation improvements and they will then invest their own resources into improvement programmes. This approach is often referred as software approach by the WASH programme.

The second approach, the hardware approach as it is called by the WASH programme, will make sure that the increased demand for sanitary latrine as a result of the software approach is met through sufficient supply. In this regard village sanitation center (VSC) is one important component of the hardware approach taken by the programme. The programme intends to establish 1,500 VSCs in the programme areas. These sanitation centers run by local entrepreneurs will produce sanitary latrine-related products such as rings, slabs and roofing-fencing materials.

From household's perspective, demand for a product may consist of both use value and non-use value (Hussen 2004, Thampapillai 2002, Carson 1999). Theoretically, these two components of demand influence household's decision to purchase a product. Thus, the amount the household is willingness to pay

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(WTP) for the product actually reflects total value of the product to the household. In the case of our study, for example, a household may pay for a sanitary latrine not only for its direct use values but also for the ancillary benefits associated with the installation of the latrine. The ancillary benefits in this case might be in the form of reduced health burden, social status, or simply improved ambient environment.

WTP is essentially the maximum amount of money the beneficiaries are willing to pay for certain hypothetical service. However, from a practical perspective to design a tariff structure it is also essential to match household's WTP with its ability to pay (ATP) (Fujita *et al.* 2005). ATP is purely a financial phenomenon that is derived from income or expenditure information of households and helps in determining the optimal tariff structure of a service.

For the programme organizers a careful analysis of WTP and ATP will add a lot of dimension for the project to be implemented at the grassroots level. For example, if household's WTP is less than its ATP then it shows reluctance of the household's decision-maker to spend money for the services. Thus, it sends an immediate signal to the programme organizers that motivation is needed to make the decision-maker understand the reasons why he or she should pay for the product. As another example if ATP is too low, it reflects the inability of the household to purchase a sanitary latrine regardless of its willingness or unwillingness to pay. A lower ATP with higher WTP calls for a favourable financial arrangement whereas a lower ATP with lower WTP calls for both financial and motivational arrangements.

In recent years WTP studies have widely been used to formulate policies, assess demand, and estimate project benefits in the water and sanitation sectors. For example, of the 35 Water Supply and Sanitation (WSS) projects processed by ADB during 2000-2006, 28 (80%) had used WTP surveys to estimate project benefits (Gunatilake *et al.* 2006). In the context of Bangladesh, recently World Bank and BRAC jointly conducted a WTP study on safe drinking water in Bangladesh (Ahmad *et al.* 2003). Another WTP study in the context of Bangladesh was conducted in 1999 to assess demand for improved water services in Dhaka Slums (Chowdhury 1999).

In line with above discussion this study aimed to provide some insights into the hardware and software approaches taken by the WASH programme from an economic point of view. With regard to the hardware approach, this study aimed to ascertain the WTP and ATP for improved sanitation services for the households without sanitation facilities in the programme areas. Regarding software approach the objective of this study was to check the validity of the hypothesis made by the programme that health education and hygiene promotion create effective demand for improved sanitation services.

Methods

Contingent valuation method

Services such as sanitation and water supply are not generally traded in markets and information on market demand or competitive market prices are often unavailable to value benefits (Yang *et al.* 2006, FAO 2000). This study used a survey-based mechanism called the Contingent Valuation Method (CVM) which has been widely used in last few decades to elicit people's preferences when market for a good is absent, imperfect or incomplete (Ahmad *et al.* 2003, Fujita *et al.* 2005). CVM creates a hypothetical market for such products and reveals the stated preference of the respondent. CVM is the standard and often the only approach that can include both use and non-use value (Carson 1999). It is well reported that, with stated preference techniques, researchers can design surveys to elicit references for goods with attributes that are not currently available in the market (Devicienti 2005).

However, for the contingent valuation (CV) survey to yield accurate results, the goods to be valued has to be clearly explained, its delivery to the public appears possible, and an expectation of realistic payment created (Carson *et al.* 2001). Due to various kinds of biases associated with a CV response it is also suggested that a substantial amount of time and effort is given in preparing the final questionnaire. Thus, the effectiveness of the CVM relies heavily on how well the questionnaire was designed and also on how well the survey was administered.

The three most pronounced biases often associated with CV approach are: a) starting point bias, b) strategic bias, and c) hypothetical bias. Thus, to ensure the reliability of the CVM findings, following approaches are often sighted by some of the subject matter experts (Devicienti 2005): (a) a conservative survey design, (b) the use of WTP rather than willingness to accept (WTA) questions, (c) the use of the referendum form rather than open-ended questions, (d) an accurate description of programme and policies, (e) a reminder of substitute commodities, (f) the use of yes-or-no follow up questions and (g) checks on the respondent's understanding of the scenario. Though efforts have been made to follow these approaches closely for this study, however, due to the programmatic nature of the study some of the conditions had to be relaxed for the sake of practical implication of the results.

Study area

Four *upazilas* were purposively selected based on their sanitation coverage and regional affiliation. For selection of *upazilas*, all the 150 *upazilas* covered by the programme were first divided into four broad strategic regions (as set by the programme). From each region only one *upazila* with the least sanitation coverage was selected. The *upazilas* initially selected for the study were Biral from Dinajpur, Barhatta from Netrakona, Jaintapur from Sylhet and Pekua from Cox's Bazar. However, Jhikargachha of Jessore later substituted Pekua due to difficulties in administrating the survey in Pekua. Sanitation coverage for these *upazilas* as listed by UNICEF were 22%, 12%, 12% and 15% respectively for Jhikargacha, Biral, Barhatta and Jaintapur.

Study population and sample size

The study population was the households that did not have any latrine. The sample size was estimated to be 784 with a prevalence rate of 15%, level of significance of 5%, and admissible error of 5%. For distribution purposes the ultimate sample size was fixed at 816. Respondents were the main income earners and the decision-makers of the households.

Sampling technique

At first all the villages within a particular *upazila* were ranked according to their sanitation coverage. Seventeen villages from each *upazila* were selected based on lowest sanitation coverage. From each village 12 households that did not have any latrine were selected purposively for interview.

Questionnaire designing, training and data collection

Data for this study were collected during March-May, 2007. Due to the nature and complexity in administrating a CV study, only eight Research Assistants (RA) were employed for three months for finalizing the draft questionnaire and to conduct the survey. At first the RAs were briefed about the study objectives and trained on the draft questionnaire for five days at the head office. For pre-testing the questionnaire, they were formed into four groups with two members in each group and sent to the four study areas mentioned earlier. The groups spent five days in their respective areas and interviewed forty households in each group. In parallel the author went to all the study areas separately and conducted two focus group discussions (FGD) in each of the four areas. The author and the RAs met back at the head office and worked on for another three days to finalize the questionnaire based on the findings from pre-testing and FGDs.

Value elicitation sequence

In the first step the respondents were briefed about the objective of the study. Respondents were told that BRAC was planning to open a village sanitation center in the vicinity. Such village sanitation center will produce everything that is needed to install a sanitary latrine. It was also told that such center would only be opened if there were enough demand for the products in the locality. Thus, the objective of the study as stated to the respondents was to get information on how much they are willing to pay for the goods and services that are going to be produced at the center.

Once the objectives were spelled out, the respondents were provided with information on estimated cost¹ of installing a sanitary latrine (Table 1). The programme organizers were more interested to find out how many people were willing to pay for the basic components e.g. five rings and a slab rather than the total package. Thus, even though respondents were briefed about costs associated with each stage of installing a sanitary latrine, the primary emphasis was to check their willingness to pay for the basic components that should cost them about Tk. 750. Maximum willingness to pay was also estimated and the method for estimating maximum WTP is discussed in the next section.

Table 1. Estimated cost (in taka) of installing a sanitary latrine

Item	Quantity required	Cost per item	Total cost
Slab	1	250	250
Ring	5	100	500
Cost for basic components	---	---	750
Transportation cost	---	---	100
Installation cost	---	---	100
Fencing and roofing	---	250	250
Total cost	---	---	1200

The respondents were then briefed about different cost sharing and payment options. To reduce the overall cost they were given the option of sharing ownership of the latrine with their neighbours. They were told that they could share the cost of latrine with at most 2 other households. As payment alternatives respondents could select either single payment or monthly installments option. The figures for monthly installments were based on 12 equal monthly repayments at the rate of 12% flat interest rate. Figures for monthly installments were rounded up to the nearest 5th or 10th. Table 2 was produced in front of the respondents to give them an idea of how much they have to pay for the option

¹ This cost was estimated in consultation with the programme organizers.

that they would select for their household. In summary the options were then to choose the type of ownership they want and the type of payment they prefer.

In the final stage the respondents were briefed once again about the objective of the study and contents of each Table produced in front of them. They were reminded of their income constraints and were instructed to take a few minutes to go through the Tables on their own before choosing the option most appropriate for them. Once the respondents stated their preferences they were asked follow up questions to identify the reasons behind their decision.

Table 2. Cost sharing (in taka) and payment options offered to the respondents

Type of service	Single payment	Monthly installments
Not interested	0	0
Share with 3 HH	250	25
Share with 2HH	375	40
Own	750	75
Interested in having latrines with additional facilities	750+	---

Other information collected

As mentioned in the objectives section, this study also aims to identify the factors that influence households WTP for installing sanitary latrines. For such analysis the needed information was collected under three broad categories of household socio-demographic information, household annual income information and household heads awareness level.

Measuring maximum willingness to pay and affordability to pay

Once a respondent made a choice from Table 2, corresponding monetary value of that choice was recorded for that particular respondent. If a respondent was found to be interested in paying for a sanitary latrine, a follow-up question was asked to find out how much the respondent is willing to pay over and above the already recorded monetary value from Table 2. If a respondent was found to be not interested in any of the options provided in Table 2, a follow-up question was asked to find out the maximum amount that respondent would be willing to pay for a sanitary latrine. The maximum WTP for any respondent was thus the summation of the amount recorded from the option chosen from Table 2 and the amount stated at the follow-up question.

ATP was measured from the household's annual income information. Usually ATP is measured based on previous surveys and experiences. Unfortunately for Bangladesh no such data were readily available. The World Bank uses a benchmark of 4% for water services and 1% for sanitation services for its water and sanitation services projects in the developing countries. Fujita (2005) had similar findings in a case study done in Peru and showed that the portion of disposable income spent on sanitation decreases as the per capita income of the countries increases. For this study we considered a range of 1% to 2% for ATP based on the rationale that per capita income is much lower for Bangladesh compared to the estimates provided by Fujita (2005) for some other countries.

Results and discussion

Willingness to pay and affordability to pay

About 82% of the households found to be interested in paying for a new sanitary latrine of which majority (73%) preferred to have their own latrine (Table 3). This overwhelming positive response of the household heads should be considered in the context of conditions stated in creating the hypothetical scenario for value elicitation. One such condition was the provision of payment alternative in the form of monthly installments. About 92% of the interested respondents preferred payment in monthly installments (Table 3). However, it cannot be ascertained from the data what percentage of households would actually be willing to pay if the option of monthly installments were not provided.

Table 3. Preferred choice of latrine

Preferred service and payment system	Percentage of household (n=802)
<i>Type of Service Chosen</i>	
Not Interested	17.96
Share with 3 HH	1.75
Share with 2HH	4.99
Own	72.94
Interested in having latrines with additional facilities	2.37
<i>Preferred Payment System</i>	
Single payment	8.01
Installment	91.99

The other thing that might have lead to this very high positive response was the provision of setting a VSC in the vicinity of the household. A qualitative study (Ahmed and Seraj 2007) conducted parallel to this study has specifically addressed the issue of the location of the VSC and found out that by vicinity most of the respondents actually understood that the VSC would be within two or three villages from their respective households. The respondents also mentioned that a VSC far away would impose rather a large transaction cost for the respondents and they might change their initial decision to pay for a sanitary latrine if this provision was altered.

Table 4 shows that for the people who were interested to make a single payment had a mean willingness to pay of Tk. 1615. This is slightly outside their ATP range of Tk. 790 to 1,580. The respondents who wanted to pay in monthly installments had an ATP ranging from Tk. 41 to 83 per month. This group had an average monthly WTP of Tk. 76 that is well within the ATP range derived. The respondents who opted not to choose any of the option provided had a yearly ATP range of Tk. 483 to 966 and a monthly ATP range of Tk. 40 to 80. Finally for the overall sample size, mean monthly WTP was found to be Tk. 69 and mean single payment amount was found to be Tk. 825. Both mean monthly and upfront payment were within ATP range calculated.

Table 4. Estimated willingness to pay and ability to pay for the surveyed households

Payment group	Single payment		Monthly payments	
	Stated mean WTP (in Taka)	ATP @ 1-2% (in Taka)	Stated mean WTP (in Taka)	ATP @ 1-2% (in Taka)
Single payment	1615	790-1580	---	---
Monthly	---	---	76	41-83
Not interested	0	483-966	0	40-80
Overall	825	512-1025	69	43-85

The households who were interested in paying for single payment had the highest ATP range compared to the households who opted for other options (Table 4). In general, households who were interested in any sort of improved sanitation had higher ATP compared to the households who were not interested in paying for a sanitary latrine. This clearly shows the income constraints of the non-interested households and was reflected in their response to the question of why they were not interested in sanitary latrine. Overwhelmingly about 67% mentioned economic hardship (Table 5). The mean WTP estimated for the overall study households was found to be well within the range of 1 to 2% of their disposable income indicating an opportunity for benefit transfer and community resource mobilization.

Table 5. Reasons stated for not installing a new sanitary latrine

Reasons stated	Percentage of respondents (n=144)
Economic hardship	65.28
Happy with current arrangements	14.58
Do not have enough space	13.89
Want free of cost	13.89

Factors affecting willingness to pay

This study used ordered logit model for regression analysis to check statistical significance of some of the underlying hypothesis behind the software approach of the WASH programme. The variables that were considered as independent for the regression analysis were: (a) household's annual disposable income, (b) size of the household, (c) education level of the household head, (d) having an unmarried daughter at home, (e) sex of the household head, (f) health awareness of the household head, (g) whether the household belong to programme intervened area or not, and (h) whether the household head is an NGO member or not.

The inclusion of variable (a), (b), (c) and (d) was based on empirical findings and from FGDs preceded the survey (Choudhury and Hossain 2006, RIC 2005, Pattanayak *et al.* 2006, Gunatilake *et al.* 2006). Variable (e) addresses the gender issue of the WASH programme. Variable (f) is directly related to the programme strategy of achieving at least 80% sanitation coverage through awareness building activities. The idea behind including variable (g) is to check whether programme interventions have any impact on WTP for households in the programme-intervened areas compared to currently non-intervened areas. Finally, inclusion of variable (h) was to check whether NGO activities in general have any impact on WTP for improved sanitation or not.

The dependent variable, on the other hand, was categorized into three ordered variables based on the responses from the value elicitation questions. The three groups in ascending orders were households who were not interested to pay for a latrine, households interested to pay just for the basic five rings and a slab, households who were interested to pay for an even better type of latrine.

The regression analysis show that odds are higher that a household with higher income will opt to pay for a latrine rather than holding the status quo (not owning a latrine) (Table 6). Similarly odds are higher that the household heads with primary education will opt for spending on an improved sanitation compared to the household heads without primary education. Having an eligible daughter at home also increases the odds of choosing a better sanitation facility. In contrast, sex of the household head was found to have a negative relation with WTP for improved sanitation. It was found that the households headed by a female member would opt for status quo rather than spending for an improved sanitation service. This is in contrast with common perceptions (HDR 2006).

Table 6. Results from the regression analysis²

Dependent variables: 1= not interested to pay anything 2 = interested to pay for shared/own latrine 3 = interested to pay for a better latrine		
Independent variables	Odds Ratio	p> z
<u>Yearly net income</u>	1.000006	0.004
Size of household	1.08264	0.070
<u>Education of household head</u>	1.524042	0.034
<i>1= Primary pass; 0=Non primary pass</i>		
Have unmarried young daughter at home	1.465197	0.084
<i>1=have a 18+ unmarried daughter at home</i>		
<i>0=no eligible unmarried daughter at home</i>		
<u>Sex of the household head</u>	.3683925	0.028
<i>1=female; 0=male</i>		
Believes that unsafe sanitary latrine leads to diseases	1.345306	0.088
<i>1=believes unsafe sanitary latrine causes disease</i>		
<i>0=do not believe</i>		
Intervention area	1.547163	0.038
<i>1= has a WASH office in the Upazila;</i>		
<i>0= do not have a WASH office</i>		
NGO member	2.722347	0.082
<i>1= NGO member; 0=non-NGO member</i>		

General awareness level was also found to be positively correlated with the type of latrine chosen. Respondents who believe that unsafe sanitation leads to diseases had higher odds of choosing a better latrine compared to those who did not believe in sanitation disease relationship. This finding also corresponds with the follow up question for the respondents who were interested to pay for sanitary latrine in the value elicitation questions. Table 7 shows that of the total respondents who showed interest in paying for a sanitary latrine 67% mentioned about health as their primary reason for the decision.

It was also found that the respondents from the *upazilas* with an existing WASH office had higher odds of choosing a better latrine compared to households from the *upazilas* that did not have any existing WASH office. This is a good sign for the programme and shows that WASH programme is already having some sort of effect on the households in the intervened areas. Finally, an NGO member was found to have higher odds of choosing a better latrine compared to a non-NGO member.

² See Annex for the results from the Brant test of parallel regression assumption and the test for multicollinearity.

Table 7. Reasons stated for installing a new latrine

Reasons stated	Percentage of respondents (n=658)
Health	66.87
Cleanliness	41.79
Prestige	38.30
Convenience	14.59
Replacement	7.14
Loss of tree cover	4.26

As stated earlier health concern was found to be one of the key reasons for willingness to pay for improved sanitation by the surveyed households. Besides health, Table 7 shows that cleanliness and prestige were also found to be two other key driving factors behind their willingness to pay. This is actually a positive sign for the programme as health awareness, cleanliness and social status have been flagged as three most important components of its sanitation promotion campaign.

Programmatic implications

- For the hardware approach of the programme, in summary, the findings of this study suggests that access and payment mechanism will play a key role in achieving the target of 80% sanitation coverage in the programme areas.
- For the case of payment mechanism, BRAC is already in an advantageous position as it already has a well established and well structured microfinance programme. Designing a microfinance scheme suited for the WASH programme should be set as one of the key priority by the programme organizers. Such provision of credit facilities have also been highlighted in the National Sanitation Strategy, 2005.
- Regarding location of the VSC, BRAC can think of providing loan to the owner of the existing village sanitation centers to build temporary sanitation outposts to reach households further away from the main VSC. This will essentially reduce the transaction cost for the buyers and increase demand for the sanitation products.
- The findings also suggests that even if proper credit facilities are in place and access to sanitation products made easier some households would not be able to install a sanitary latrine due to economic hardship. The national sanitation strategy emphasized on this issue of identifying these so called hardcore poor households and kept the provision of partially or fully subsidizing these households. However, it was also mentioned in the national strategy that no hardware support or subsidy should be provided except for the hardcore poor. Thus, the issue of effective targeting of hardcore poor should be taken seriously.
- This study has established a causal relationship between health awareness and WTP for improved sanitation. Cleanliness and prestige was also found to be two key factors for choosing a sanitary latrine by the respondents who were willing to pay for a sanitary latrine. Essentially this implies that with proper awareness building activities it is possible to induce people to spend money for sanitary latrine.
- It was found that the households of the villages with already active WASH programme had higher odds of spending money for a sanitary latrine compared to villages without WASH activities. This finding might be attributed to the positive response of households to WASH programme.

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Annex

Table 1. Brant test of parallel regression assumptions¹

Variables	Chi2	p>chi2	Df
All	10.79	0.214	8
Income	3.14	0.076	1
Size of household	0.06	0.803	1
Education	0.04	0.847	1
Unmarried young daughter at home	0.81	0.369	1
Sex of the household head	4.15	0.042	1
Believes that unsafe sanitary latrine leads to diseases	1.33	0.248	1
Intervention area	0.12	0.731	1
NGO member	0.09	0.760	1

Table 2. Collinearity Diagnostics

Variable	VIF	SQRT VIF	Tolerance	Eigenval	Cond Index	R-Squared
Income	1.14	1.07	0.8745	1.5828	1.0000	0.1255
Household size	1.31	1.15	0.7625	1.2065	1.1454	0.2375
Education	1.05	1.02	0.9532	1.1926	1.1520	0.0468
Eligible daughter	1.06	1.03	0.9430	1.0933	1.2032	0.0570
Sex of the head	1.12	1.06	0.8939	0.9193	1.3122	0.1061
Awareness	1.03	1.01	0.9717	0.7823	1.4224	0.0283
Intervention area	1.13	1.06	0.8817	0.7131	1.4898	0.1183
NGO member	1.10	1.05	0.9125	0.5102	1.7614	0.0875

Mean VIF = 1.12

Condition number = 1.7614

Determinant of correlation matrix = 0.6514

¹ A insignificant chi-square value suggests that ordered logit assumptions are met