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Free Provision and Demand for Health Products

Evidence from follow-up of a randomised control trial study in Bangladesh

Minhaj Mahmud
Ananta Z. Neelim
Abu Mohd Naser Titu

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Minhaj Mahmud[1]

Ananta Z. Neelim[2]

Abu Mohd Naser Titu[3]

Abstract

We elicit demand for a water disinfectant tablet (Aquatab) among rural households in Bangladesh in the specific case of free provision. We did not find any significant effect of free provision on long-run demand. In fact, even a year later of the efficacy study, both the free users of Aquatab and non-users were willing to pay roughly 50 percent of the announced market price suggesting that free provision did not dampen long run demand. Our results also suggest that there is a strong effect of arbitrary price anchors on individuals' willingness to pay, irrespective of free provision. However, suggestive of "coherence", we find more people are willing to purchase at higher discounts (lower price).

Keywords: health product, willingness to pay, anchoring

JEL Codes:

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[1] BRAC University, Bangladesh. Corresponding author. Email: minhajmahmud@gmail.com

[2]University of Nottingham, Malaysia

[3]Emory University, USA

1. Introduction

Understanding individual demand for health products is important for various stakeholders involved in water demand management as well as for policy makers in developing countries. There is an existing policy debate on whether health products in developing countries should be provided at zero prices (Sachs, 2005), or on a cost-sharing basis between the state and consumers (Easterly 2006). The main argument against free provision is that it is financially unsustainable and more importantly it generates wastage by providing wrong incentives. Cost sharing advocates argue that allowing consumers to bear some cost of the good incentivises its proper usage and more importantly, screens out people who do not have any valuation for the product. While free provision advocates suggest that policy goal, especially with regards to products which prevent communicable diseases, should be to ensure that the maximum share of the population is included and that asking individuals to share the cost can sometimes become prohibitively expensive for the neediest. One key element that has been missing from the debate is that, whether the estimation of demand is contaminated by free provision of goods via the formation of a sense of entitlement from previous free provision. This study builds on a recently implemented randomised control trial study where point-of-use (portable) water treatment products were provided free amongst a study population. We aim to investigate whether positive prices; and subsequently zero prices, act as arbitrary anchors, affecting users' willingness to pay for the same health product.

Some very interesting findings have emerged recently from research on some core issues surrounding the above policy debate. Firstly, there is evidence that asking individuals to share costs has huge implications on uptake. Cohen and Dupas (2010) based on a randomized controlled trial(RCT) experiment conclude that cost-sharing does indeed decrease demand for insecticide treated bed-nets (ITNs) by sixty percent when subsidies are reduced from 100 to 90 percent. Similarly in Kenya, when schools were asked to pay between 20 to 60 percent of the market price, as opposed to free provision, uptake dropped by 56 percentage points (Kremer et al 2011). A survey article by Bates et al (2012) also documents other instances of substantial drops in uptake of health products when consumers were asked to share costs *vis a vis* free provision. Secondly, there is evidence that free provision does not lead to underutilisation of health products. Dupas (2014a) in a survey article provide evidence from RCT experiments that high subsidies (including free provision) do not significantly alter usage of insecticide treated bed nets or chlorine dispensers. Furthermore there is also no evidence that highly subsidized or freely provided products are valued at a lower level than unsubsidized products. For example, Dupas (2009) and Cohen and Dupas (2010) show that there is no statistical difference between the usage rates of bed nets amongst individuals who received it for different prices. Relatedly, Ashraf et al (2010) show that paying more for a water treatment product does not lead to higher usage rate due to sunk cost effects[1]. There is also evidence that the intensity in the drop in demand is larger when price increase from zero (free provision) to a small positive price compared to drops in demand due to further increases in price (Kremer et al, 2011). This is perhaps driven by the fact that the expectation of even small cost sharing on the part of the neediest people (the poor) can be enormous and as a result they will be screened out. In fact, Tarozzi et al (2013) show that alleviating financial constraints through micro-loans can significantly increase demand for bed nets even when individuals are asked to pay the full price for the product. However, they also show that demand with micro-loans is still a half of that when bed nets are provided for free. This suggests that financial constraints cannot fully explain drops in demand due to financial constraints.

[1] Sunk cost effect arises from the idea that people who pay for a particular product derive displeasure for not utilizing something that they have paid for (Thaler, 1980).

Another possible explanation for the drop in demand is with regards to reference dependence or entitlement formation *i.e*. households that receive products for free or at a subsidized rate (during a necessary promotion phase to facilitate learning of experience goods) might anchor their valuation of the product to the free or subsidized rate and subsequently reduce demand when asked to pay a higher price (Koszegi and Rabin, 2006). Under such reference dependent preferences it might be the case that short run free provision may reduce long run uptake (Dupas, 2014b) if the effect of entitlement formation is greater than the effect of positive experience of using the product. In fact in Guatemala, there is strong evidence even after observing high efficacy (39 percent less diarrhoea) households who received flocculants – disinfectants for free were not more likely to demand when they were to purchase at a positive price (Luby et al. 2008). Furthermore, Luoto et al. (2012) in a RCT study conducted in Bangladesh, show that households that received water treatment products (chemical products) for free later exhibited lower willingness to pay than the control group. However, there is also evidence of increases in long-run demand following short run subsidy. For example, Dupas (2014b) shows that short run subsidies lead to higher adoption for bed nets in Kenya through positive learning effects which dominates anchoring or entitlement effects. In fact reduced form estimates show no evidence of anchoring effects influencing households' uptake of bed nets.

In this paper we elicit demand for a water disinfectant tablet among rural households in Bangladesh. Our study leverages on an existing RCT study analysing the health impact (efficacy) of the water disinfectant tablet as well as water storage vessel whereby treatment households received one or more product free of costs for ten months versus control households receiving none of these. Using Becker-DeGroot-Marschak (Becker et al 1964), auction procedure we elicit willingness to pay (WTP) and investigate whether zero prices and subsequently positive prices act as arbitrary anchors affecting users' WTP for heath product.

Our design allows us to identify the effect of entitlement as well learning in the special case of free provision. Unlike Dupas (2014b), we experimentally vary price anchors for people who had previously received the product for free in the efficacy study versus people who had not received the product, and examine the effects of these price anchors on demand.

We did not find any significant effect of free provision on long-run demand. In fact, even a year later of the efficacy study, both the free users of Aquatab and non-users were willing to pay roughly 50 percent of the announced market price suggesting that free provision did not dampen long run demand. This is consistent with the findings of Dupas (2014b) who found that long run uptake of preventive health product (bed nets) was not affected by past prices. Our results also suggest that there is a strong effect of arbitrary price anchors on individuals' willingness to pay, irrespective of free provision. However, suggestive of "coherence", we find more people are willing to purchase at higher discounts (lower price). This "coherent arbitrariness" preference is consistent with earlier laboratory findings of Ariely et al. (2003), which suggest that 'people respond sensibly to noticeable changes in price although their responses base initially around a normative anchor'(here announced market price). To our knowledge this is the first experimental evidence from a developing country demonstrating such "coherent arbitrariness" in individual's preference for a health product. Our paper also contributes to the emerging literature on pricing of health products as well as on the policy debate of free provision versus cost sharing.

The remainder of the paper is organised as follows. Section 2 documents the background study setting. Section 3 discusses the conceptual framework, experimental design and study protocol. Section 4 discusses the results of our experiment and Section 5 concludes the paper.

1. Background: Efficacy Study

The present study leverages on a RCT study that looks into the impact of chlorination and safe storage of tube-well water on childhood diarrhoea in rural Bangladesh. This efficacy study was carried out by the icddr,b across 87 randomly selected villages in Fulbaria subdistrict of Mymensingh district of Bangladesh. In these 87 villages, 1800 households were randomly selected based on the eligibility criteria of having one household member between the ages of 6 months to 18 months. These 1800 households were further randomly sampled into three groups and were assigned to three study arms defined as Control, Storage and Aquatab. Households assigned to the control arm did not receive any products, whereas households assigned to the Storage and Aquatab arms both received a safe storage vessel. In addition only households in the Aquatab arm were given free (point of use) water treatment tablets. Across any given study village, participants from all three study arms were present. These study households were visited for ten unannounced follow ups to ascertain the usage of these products (safe storage vessel and Aquatab) and subsequent impacts of these on childhood diarrhoea. The results of the intervention suggest that there was very high levels of uptake and usage of products. Over eighty-five percent of the subjects utilised their safe storage in both the Aquatab and Safe Storage arm across ten follow ups. Amongst the people who used the safe storage vessel in the Aquatab arm, 83 percent of them had chlorine residue in the stored water, suggesting high usage rates of Aquatab in that particular study arm. In terms of impact on childhood diarrhoea, safe storage vessel (with or without the usage of Aquatab) drastically reduced diarrhoea prevalence. The prevalence rate of diarrhoea was 64 (69) percent of that of the control arm in the Aquatab (Safe Storage) arm. However, there was no statistically significant difference in the prevalence rate of diarrhoea across the Aquatab and Self-Storage arm. (Naser, 2013)[2]. At the end of the efficacy study each household in the

[2] http://www.icddrb.org/publications/doc_download/7892-vol-11-no-4-english-2013

control arm were given a free safe storage vessel. We re-visited these households (n= 500)[3] twenty months after the completion of the efficacy trial to examine household willingness to pay for Aquatabs[4].

2. Conceptual Framework and Experimental Design

The main experimental intervention of the experiment follows from the behavioural evidence that individuals' preferences are malleable and that it can be dependent on external environments (Ariely et al 2003). Specifically, it has been shown that individuals willingness to pay for a particular product can be altered by informing them about a single price of that particular product (past or present), price of a close substitute, an unrelated product and even an arbitrarily generated price(see for example; Adaval and Monroe, 2002; Adaval and Wyer, 2011; Chapman and Johnson, 2002; Krishna, Wagner, Yoon, and Adaval, 2006; Nunes and Boatwright, 2004; Simonson & Drolet, 2004; Tversky and Kahneman, 1974). The information about prices has been shown to act as anchors when individuals express their willingness to pay for the product in question. In the context of Aquatab, household willingness to pay can be dependent on learning effect (due to usage of this product) or reference dependence (potential entitlement formation due to free provision)[5].

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[3] There was attrition due to multiple factors during the first RCT, which lasted about 11 months. In addition further attrition took place between our study and the first RCT.

[4] Although our initial plan was to conduct this experiment six months after the completion of the RCT study, we were unable to do so due to research grant approval and other administrative delays.

[5] The Aquatab recipient households are the only ones in the sample who may have reference dependent valuation of the product due to free provision. If they were to be asked to value it they may express a lower willingness to pay for these water disinfectants than the non-recipient households. However, at the same time, these households were also the only ones who would observe the health benefits associated with using these tablets (i.e. positive learning effect). While the health benefits from using (usage rate of 85%) the only tablets were negligible one cannot discount the possibility that the households which received Aquatabs attributed the improvements in health to Aquatabs and not to the safe storage vessels. If that is indeed the case then that would provide a positive experience for these households leading them to have a higher valuation for Aquatabs. This

Use of two separate price anchor in our experiment allows us to disentangle these two effects. Prior to the willingness to pay elicitation task, half of the participants, across three arms of the efficacy study (i.e. Control, Aquatabs, Storage) are informed that the expected market price for two weeks supply of the product will be Tk 20 (High price treatment; hereinafter HIGH) and the other half were told that this was Tk 10 (Low price treatment; hereinafter LOW)[6]. For the households that did not receive Aquatabs for free (control and storage arm in the efficacy study), these prices would act as the only price anchors. If indeed preferences were dependent on initial price anchors, valuation of Aquatabs would be significantly higher for households in the HIGH compared to households in the LOW.

On the other hand for households that received Aquatabs for free during the efficacy study, valuation of Aquatabs would be dependent on two anchors: the price anchor that we introduced in the experiment and the anchor from receiving Aquatabs for free during the efficacy study. The difference in valuation of Aquatabs across the two price treatments (HIGH vs LOW) thus would be the effect of price anchor conditional on free provision. If the estimate of the expected market price follows a simple linear combination of the two anchors for these households, $\boldsymbol{x}\ (\boldsymbol{anchor\ 1}) + \boldsymbol{y}\ (\boldsymbol{anchor\ 2}),\ \boldsymbol{where\ x + y\ \leq 1}$}, then it will be significantly different for these households compared to the ones who only receive one anchor. If that is the case then the valuation of the product will be different across households that did or did not receive Aquatabs for free. Specifically the effect of price anchors (HIGH and LOW) would be smaller in the case where it is conditioned on free provision versus the case when it is not.

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poses a significant problem in examining the effect of free provision on willingness to pay as now it is entangled with the effects of positive experience of using the products.

[6] Aquatab is not readily available in the markets in Bangladesh. The cost of Aquatab in the USA is about Taka 11-12 per two weeks supply during the period of study. However, considering commercial costs of importing and logistics, the actual fully market price for two weeks supply could indeed be around Tk 20. This means that the price anchor we chose for our study represented either full price (Taka 20) or fifty percent subsidy (Tk 10).

3.1 Willingness to Pay Elicitation: Becker-DeGroot-Marschak (BDM) auction

To elicit demand (willingness to pay) for Aquatab we used a modified version of the Becker-DeGroot-Marschak (BDM) auction procedure (reference). In the standard BDM auction, where bidders' weakly dominant strategy is to reveal their true valuation, a bidder first submits her bid for the good in question. Experimenter then draws a random number from a pre-specified distribution or from a range of price which is informed to the bidder. If the submitted bid is greater than the random price, the bidder wins and purchases a pre-specified unit of the good at the randomly drawn rice. That is subjects are usually informed a price range from which the actual transaction price of that particular product, for which the willingness to pay is being elicited, lies. Subsequently, they are asked to state their WTP for that product. Once the task is completed, the experimenter draws a random number from that range. Conditional on the bid and the number drawn the responder gets the opportunity to buy the product. If the bid is greater than or equal to the randomly drawn number then the respondent qualifies (wins) to purchase the product, otherwise she doesn't. BDM procedure elicits incentive compatible responses given that the respondents understand the procedure. Sometimes it might be cognitively difficult on the part of respondents. To facilitate better understanding, we use a modified BDM procedure whereby subjects are asked a string of multiple binary choice questions to respond in order to express their valuation for the product. The way we define the BDM procedure is slightly different and instead of reporting just one value for WTP, we ask each respondent if they were willing to pay at various discounted prices. The subjects were asked about their willingness to pay about various prices one by one.

Specifically, our study participants were told that that the discount they will get in the survey will range from 10 percent to 80 percent (90 percent in the HIGH price treatment). They were informed that the actual discount rate was predetermined by a lottery and was kept inside an envelope and was even unknown to the survey administrator. Furthermore they were notified that both the administrator and the participant would open the envelope after the participants have answered a set of questions about their willingness to buy the product at different prices. The rule for winning the auction and hence eligibility to buy the product was as follows: based on the answers given and the discounted price in the envelope, if the participant indicated that s/he would be willing to purchase the product at that (envelop) price, and then s/he would get the opportunity to do so. However, if she indicated that she would not be willing to purchase the product at that discounted price then she would not get the opportunity to purchase it. This rule was reiterated and a full practice round of this process was conducted to ensure that participants clearly understand the procedure/protocol and hence the implication of their responses.

Assignment of participants to HIGH or LOW treatment was done randomly. All the participating households were ordered in ascending way based on the study ID from the efficacy study after which a random number generator was utilised to assign each of these participating households a number between 0 and 1. If the number assigned to IDs was greater than 0.5 they were assigned to HIGH and if the number assigned to IDs was less or equal to 0.5 they were assigned to LOW treatment group.

3.2 Experimental Protocol

All protocols across HIGH and LOW treatments were the same, whereby they were informed about the purpose of the day's visit, given a small account(information) on the health benefits of using Aquatab, informed about the promotional price opportunity and the lottery process and then asked to fill out a small questionnaire at the end. They were informed about the purpose of our research, which was to understand the demand for Aquatab.

Each available household from the efficacy study were revisited and an adult member who is responsible for making household decisions was approached for an interview to elicit demand for Aquatab. For the benefit of the study population, we provided a small recap about the health benefits of water disinfectant Aquatab and then informed them of the expected market price for two weeks supply. We notified them that as a survey participant there will be an opportunity to purchase two weeks supply of Aquatab at a discounted price determined by a pre-determined lottery (the willingness to pay elicitation task). The participants were given descriptions of the lottery process and were then asked whether they would participate in it. It was made clear to them that if they become eligible to buy the product through winning the auction they will be obliged to buy two weeks supply of Aquatab at the lottery determined discounted price. Upon completion of the WTP elicitation task each subject was interviewed using a set questionnaire to get information on household characteristics and health behaviour.

4. Results

Our study was conducted among 1500 households that we could finally identify and revisit out of the initial 1645 households that were surveyed in the original RCT efficacy study. This translates to a 91.2 percent revisit rate after 20 months of completion of the last follow up of the efficacy trial. Out of these 1500 households, 488 (32.5 percent), 499 (33.27 percent) and 513 (34.2 percent) were in the Aquatab, Safe Storage and Control treatments in the original study. In our case, 753 households (49.5 percent) are in the HIGH treatment and the rest, 757 households are in the LOW treatment. As a result of randomization, of the households assigned in the HIGH treatment, 32.8%, 33.4% and 33.8% belong to the Aquatab, Safe Storage and Control treatments respectively of the original study. In the LOW treatment, these numbers were roughly similar, 32.2, 33.2 and 34.6 percent respectively (see Appendix 1).

The baseline sample characteristics are reported in Table 1. The average household size was 5.35 members and 96 percent of these households owned their homestead land. The average total expenditure per month was around Tk 7950, while the mean years of schooling for the mother of the children was 4.7 years. The fathers on average had lower levels of education with a mean of 3.44 years. The average landholding per household was 52.45 decimals of land and around 40 percent of the households had access to microfinance loans. Four percent of the households had female heads and 2.5 percent of the households had a disabled member. In terms of prevalence of diseases, 9 percent of the households reported that a child in their household has experienced diarrhoea in the last two days, while 19.2 percent reported that the same for fever.

Randomization and Balance Check

To check balance across our treatments we conduct two randomization checks with regards to observable characteristics collected during the baseline of the efficacy study as well as during our willingness to pay study. Specifically, we conduct balance checks (i) across our HIGH and LOW treatments and (ii) across HIGH and LOW treatments within each original study arms. These are presented in Table 1 and Table 2 respectively. According to Table 1, in all of the observable characteristics, there is no statistical difference across the HIGH and LOW treatments. With regards to individual study arms as well, generally there is evidence of balance across the subgroups. In the Aquatab and the Storage arms none of the observable characteristics is different across the HIGH and LOW treatments at a significance level of 5 percent. However, in the Control arm access to microfinance is 10.7 percentage points larger in the HIGH treatment compared to that in the LOW treatment (p-value =0.01; T-test). While we do not envision this difference to significantly affect the WTP estimates due to the relatively low prices of Aquatab, we control for it in our regression analysis.

Experimental Results

We begin by analysing the individual decision to participate in the willingness to pay elicitation study (BDM Auction). Each respondent, after they were demonstrated the BDM lottery process was asked whether they would like to participate and buy the product. Overall a significant portion, 14.3 percent, of the participants chose not to participate (see Table 3). The main reasons for not choosing to participate in this process were related to either disinterest in the product or financial constraints (see Table 4). Out of the participants who chose not to buy Aquatab, 57 percent of the respondents cited disinterest in the product, 45 percent cited financial constraints and 21 percent cited preference of other methods of water purification as reasons for their decision not to purchase Aquatab[7]. Across study arms refusal rate to not purchase Aquatab was highest in the Aquatab arm, which was 16.1 percent. This refusal rate was 12.2 percent and 14.4 percent in the Safe Storage and Control arm respectively. The difference between refusal rates is not statistically different (at p - value <0.05, pair wise t-tests) between any of the study arms. Conversely, we find statistically significant difference across the price treatments for the whole sample (p – value = 0.04; T-Test): In the HIGH treatment, 16.2 percent of the participants refused to participate which was larger than that in the LOW treatment, 12.4 percent. However this difference across HIGH and LOW treatment is not consistent across the study arms and is driven by behaviour in the Safe Storage arm. This difference is 0.4 percentage points in the Aquatab arm (p – value = 0.90; T-test), 7 percentage points in the Safe Storage arm (p – value = 0.02, T-test) and 3.7 percentage points in the Control Arm (p – value = 0.23). Furthermore, if we use the subset of the people who identified that financial constraint was not the reason for their refusal to buy the product, the difference in refusal rates across HIGH and LOW treatment becomes statistically insignificant for the whole sample and across all the study arms (Table 3). This suggests that price does not act as a signal of quality when individuals decide whether to choose or not choose to purchase the product with this effect being smallest for the participants in the Aquatab arm, who have the most experience in using the product. In

[7] This was a multiple answers question.

terms of valuation of the product (conditional on not refusing to purchase the product), participant willingness to pay was relatively large. In the LOW treatment 33.4 percent of the participants wanted to buy the product at Tk 9, which represented a mere ten percent discount. Similarly, around 65 percent of the participants were willing to purchase the product at least 50 percent discount, i.e. Tk 5. From Figure 1 and Table 4, we can observe that the mode willingness to pay was Tk 9 followed by Tk 5. This suggests that a significant portion of the participants were willing to share a big fraction of the full expected market price and majority of the participants were willing buy Aquatab at a 50 percent discounted price in the LOW treatment. At 80 percent discount, which is Tk 2, almost all the participants, were interested in buying the product. In the HIGH treatment we see similar patterns in bidding behaviour. 16.1 percent of the participants wanted to buy Aquatab at the 10 percent discounted price of Tk 18. The mode willingness to pay in the HIGH treatment was Tk 10 (50 percent discount) followed by Tk 18 (90 percent discount). At the 50 percent discounted price, 47 percent of the participants were willing to purchase Aquatab, which went up to 99 percent when discount was 90 percent, i.e. Tk 2. In both these treatments it is important to notice that below the 50 percent discount, where individuals are expected to pay more than half of the announced price, there is a huge drop in demand. This along with the observation significant maximum bids at 50 percent discount value suggests that there is some systematic heuristics that people utilise when participating in these willingness to pay elicitation tasks.

Based on the bidding responses we create a demand schedule which is represented in Figure 3. From the Figure 3, we can see that quantity demanded, measured as the proportion of respondents willing to buy the product at any particular price, is negatively related to these particular bid(prices). This is true for in both HIGH and LOW treatments. This shows that preferences for Aquatabs translate to normal demand for the product. At the same time the figure also exhibits the effect of arbitrary price anchors. The demand exhibited by individuals in the HIGH treatment is systematically higher than that in the LOW treatment In terms of both mean (Table 6, p-value: <0.01, T-test) and distribution (Figure 1, p-value: <0.01, Kolmogorov Smirnoff) WTP in the LOW and HIGH treatments are statistically different.

While we find huge impacts of the price treatments on WTP, we find very little difference across the three study arms within each of these treatments. From Figure 2, Figure 4 and Figure 5 we can observe that there is very little difference in the WTP elicitation across study arms. In fact from Table 5 (right-most column), we can see that none of mean WTP across the study arms (within each price treatment) are statically significant. Furthermore, the distributions of WTP are also not statistically significantly different (Figure 2).

To test the effect of free provision on future demand, in Section 3, we argued that if free provision does affect willingness to pay then the impact of our arbitrary price anchors will be smaller in the Aquatab arm compared to the Control arm. To test whether that is the case, we run set of regressions. Some of these regressions control for household level characteristics and village level heterogeneity and thus also provide a validation check for all the results presented in this section so far. The regression estimates are reported in Table 7. We utilise the maximum WTP elicited by households as the main dependent variable in all our different specification. In the first three columns, we analyse the unconditional impact of price anchor treatment on maximum WTP. Column (1) reports results from the specification which does not account for either household level or village level heterogeneity. Column (2) and (3) report estimates accounting for those progressively. In all three columns LOW treatment is the default omitted category. From Table 7, we see that coefficient for HIGH treatment is positive and significant suggesting that the effect of price anchors is robust to household and village level heterogeneity. In addition we find that households that have larger land holding have a higher willingness to pay for Aquatab. If we consider landholding as a proxy of wealth, this result is perhaps not surprising. All other household characteristics do not influence the demand for Aquatab, including that of Microfinance access.

In columns (4) through to (6) we report effect of price treatment conditional on study arms. The main difference across these specifications is the same as in columns (1) - (3) in terms of accounting for household and village level heterogeneity. In these estimates LOW treatment Aquatab arm acted as the default omitted category. Based on the coefficient estimates from the regressions (panel A) we report the difference estimates of price treatment across the three study arms in panel B. From these estimates, not surprisingly, we can observe that there is a strong significant effect of price treatments in all three of the study arms. More importantly, we can also observe that the strength of the price treatment effect is not very different between the three arms. As observed the LOW –HIGH difference between the Aquatab and control arm ($-\boldsymbol{\Delta C}$) which is the difference in the strength of the price treatment effect between Aquatab and control arm, is not significantly different from zero. This suggests that in our sample we find no evidence of effect of free provision on long term demand for Aquatab.

3. Conclusions

In this paper we elicit long-run demand for water disinfectant tablets in rural areas in Bangladesh in the specific case of free provision. We leverage on an efficacy trial, completed twenty months prior to this study, which provided a group of people the opportunity to use the product for free for ten successive months. Using this variation and by introducing price treatments (HIGH and LOW), we investigated whether free provision (i.e. zero prices) and positive prices act as arbitrary anchors in user's willingness to pay.

Our results provide evidence that free provision did not dampen long run demand for the water disinfectant: 20 months later free majority users were willing to pay roughly 50% of the announced market price for Aquatabs with no difference across people who experienced free provision or not. While we do not find long run effects of free provision through entitlement formation, we cannot discount the possibility that if we investigated short run impacts the results would have been different as free provision would have been more salient in that case. However, our results are consistent with findings of Dupas (2014 b), who also show that short run subsidies have low impacts on long run demand.

We find that both the mean and distribution of WTP is significantly higher in high price treatment group (HIGH) compared to low price treatment group (LOW), irrespective of free provision (experience). This is quite interesting and suggestive of powerful effect of anchoring: announced market price acts as powerful anchor resulting in higher valuation for the product. While our results show a strong effect of arbitrary price anchors on individuals' willingness to pay, interestingly we also find willingness to pay was systematically related to price discounts: at higher discount prices, the share of people willing to pay for two weeks supply of Aquatab increased. According to Ariely et al (2003), this behavioural pattern is suggestive of "coherent arbitrariness" whereas people respond sensibly to noticeable changes in price, but their responses are based around initial normative anchor (in our case the announced market price acted as arbitrary anchor). As suggested by Ariely et al (2003) , the implication of "coherent arbitrariness" is that if price changes are not drawn to the attention of the users, i.e. full information of changes in prices (or quality) are not provided, they may not respond reasonably reflecting fundamental values. Dupas (2014b) also points out that estimating the effect of subsidies (full or partial) by providing full information about non-subsidized price is of direct policy interest and that for products which are not familiar or whose price is relatively unknown such as water disinfectant in our case anchoring effect might be larger.

Knowing individuals' demand for health products such as water disinfectant technology is important to stakeholders involved in water demand management as well as for policy makers in developing countries. We did not find evidence of users' long-run demand being affected by initial subsidies and our findings suggest that people are willing to share costs up to a level (on average majority of participants regardless of past experience, were willing to pay at least 50% of the announced market price) when given full information about the potential retail price of the product. We believe future demand assessment exercises would benefit from the findings of our study as it explicitly addresses the issue of anchoring in willingness to pay elicitation.

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Table 1: Baseline sample characteristics

Variable	**Full Sample**	**Treatment High Price**	**Treatment Low price**	**P value of difference**
Average Total Expenditure+	7942	8075	7812	0.27
Access to Microfinance Loans+	0.4	0.41	0.39	0.51
Diarrhoea of < 5 child in the last 2 days+	0.09	0.091	0.086	0.84
Fever of <5 child in the last 2 days+	0.192	0.2	0.18	0.30
Land Holding (Non Homestead)	52.45	48.77	56.07	0.30
Education of Mother	4.63	4.53	4.71	0.35
Education of Father	3.68	3.56	3.8	0.27
Household Size	5.35	5.32	5.37	0.65
Female Household Head	0.04	0.04	0.04	0.84
Disabled Member in Household	0.025	0.03	0.02	0.47

Notes: P-values based on T-test. *** <0.01, ** <0.05 and * <0.1
+ These values were collected as a part of this round of data collection. All the other variables were collected during the baseline of the efficacy study.

Table 2: Baseline Sample Characteristics across study arms and price treatments

Variable	Aquatab			Storage			Control		
	High	Low	p value	High	Low	p value	High	Low	p value
Average Total Expenditure+	8236	7784	0.24	7897	7822	0.83	8046	7829	0.64
Access to Microfinance Loans+	38.1	38.9	0.85	37.9	43.0	0.24	45.8	35.1	0.01**
Diarrhoea of < 5 child in the last 2 days+	0.06	0.06	1.00	0.09	0.10	0.42	0.118	0.107	0.70
Fever of <5 child in the last 2 days+	0.17	0.18	0.64	0.15	0.21	0.09*	0.229	0.219	0.79
Land Holding (Non Homestead)	44.1	51.5	0.54	47.1	50.8	0.72	54.9	65.4	0.45
Education of Mother	4.7	4.6	0.77	4.5	4.76	0.52	4.35	4.76	0.21
Education of Father	3.44	3.8	0.35	3.6	3.9	0.40	3.62	3.67	0.90
Household Size	5.29	5.47	0.33	5.27	5.4	0.51	5.41	5.26	0.41
Female Household Head	0.05	0.05	1.00	0.04	0.02	0.21	0.04	0.05	0.47
Disabled Member in Household	0.03	0.03	1.00	0.02	0.02	0.77	0.03	0.11	0.11

Notes

P-value based on T-test. *** <0.01, ** <0.05 and * <0.1

+ These values were collected as a part of this round of data collection. All the other variables were collected during the baseline of the efficacy study.

Table 3: Refusal Rate across study arm and price treatments

	Full Sample	Aquatab	Safe Storage	Control	*p – value*
Refusal rate					
Overall	14.3				
		16.1	12.2		0.07*
		16.1		14.4	0.44
			12.2	14.4	0.31
LOW	12.4	15.9	8.8		0.01**
		15.9		12.6	0.28
			8.8	12.6	0.16
HIGH	16.2	16.4	15.7		0.84
		16.4		16.3	0.99
			15.7	16.3	0.85
p - value	0.03**	0.9	0.02**	0.23	
Refusal Rate (Non-financial)					
Overall	7.8	9.2	6.4		0.1
		9.2		7.8	0.42
			6.4	7.8	0.39
LOW	6.7	8.6	4.7		0.09*
		8.6		6.8	0.46
			4.7	6.8	0.31
HIGH	8.9	9.8	8.1		0.49
		9.8		8.8	0.68
			8.1	8.8	0.78
p - value	0.12	0.55	0.13	0.43	

Notes

P-value based on T-test. *** <0.01, ** <0.05 and * <0.1

Refusal rate (Non-financial) was calculated by dropping individuals who chose not to purchase based on financial reasons.

Table 4: Reasons for not buying

Reasons for not buying	%
Not interested in the product	57.0
Product will not work	8.4
Purify water in other way	21.0
Will not pay for water purification	17.8
Do not trust calculations	4.2
Taste of water deteriorates	5.1
Other people said product doesn't work	1.9
Do not have money	45.3
Have to discuss with other members of the Household	9.3
Do not believe in lotteries	6.5

Notes:
Question had provisions for multiple answers.

Table 5: Distribution of Maximum Willingness to Pay

Max WTP	Full Sample		AQUATAB		STORAGE		CONTROL	
	High	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**
< 2	1.0	0.5	0.5	0.0	1.4	0.9	0.9	0.4
2	1.1	2.0	1.5	1.0	1.4	2.2	0.5	2.6
3	0.3	2.4	0.5	1.0	0.5	3.0	0.0	3.0
4	1.8	5.1	1.0	3.9	1.4	4.8	2.8	6.5
5	7.5	25.4	8.3	28.8	5.7	26.0	8.5	21.7
6	2.1	12.5	1.5	16.6	2.4	9.5	2.4	11.7
7	2.7	11.0	1.5	10.7	2.4	11.3	4.2	10.9
8	4.5	7.7	2.4	7.3	4.8	6.9	6.1	8.7
9	3.2	33.6	3.9	30.7	2.4	35.5	3.3	34.3
10	28.5		30.2		29.0		26.4	
11	1.3		1.0		1.9		0.9	
12	8.0		8.8		6.2		9.0	
13	2.9		1.5		5.2		1.9	
14	2.7		2.9		4.3		0.9	
15	12.8		11.7		10.5		16.0	
16	2.6		2.9		1.9		2.8	
17	1.1		1.5		1.4		0.5	
18	16.1		18.5		17.1		12.7	

Table 6: Mean WTP across study arms and price treatments

	Full Sample	**Aquatab**	**Self - Storage**	**Control**	***p value***
WTP (conditional on choosing to buy)	8.99	9.16	9.05		0.68
		9.16		8.79	0.16
			9.05	8.79	0.33
WTP (P High)	11.44	11.71	11.6		0.79
		11.71		11.04	0.11
			11.6	11.04	0.18
WTP (P Low)	6.7	6.63	6.73		0.63
		6.63		6.72	0.66
			6.73	6.72	0.96
p value	<0.01***	<0.01***	<0.01***	<0.01***	

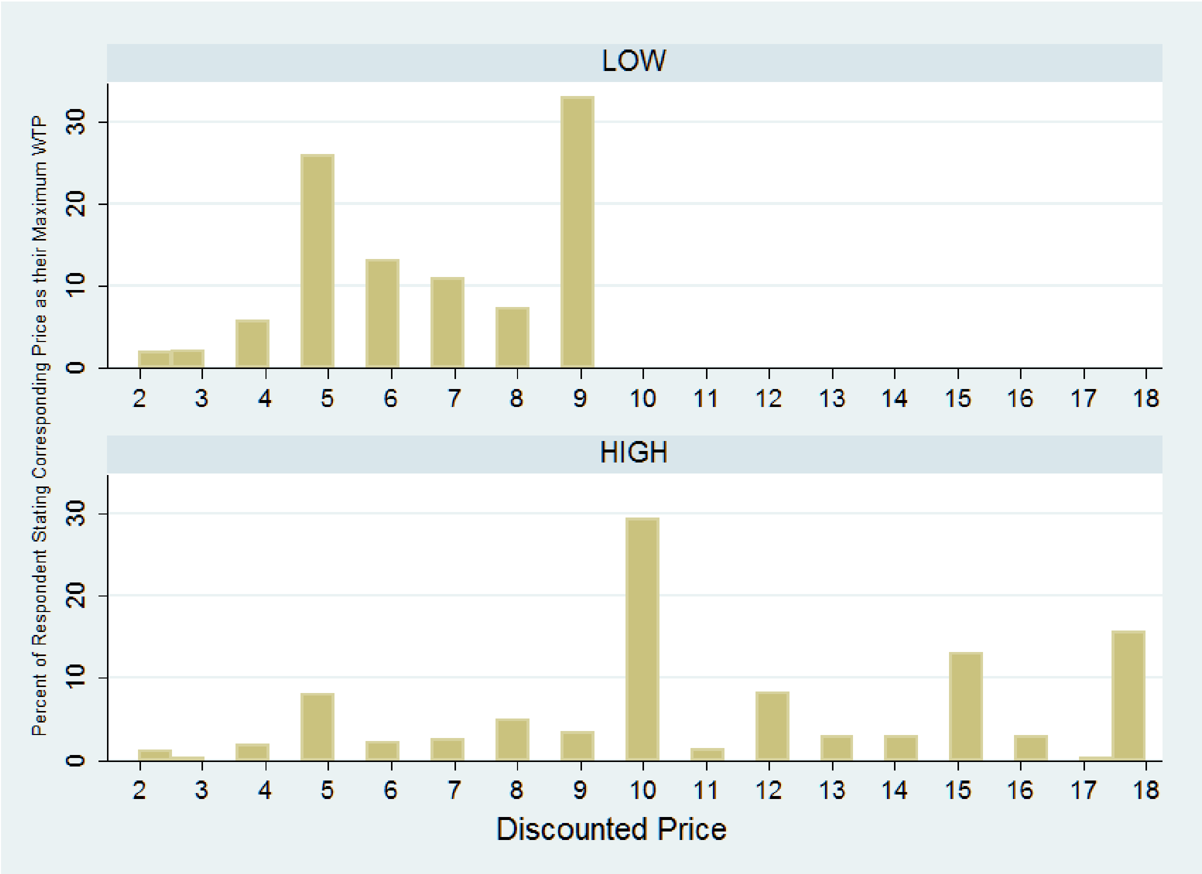
Notes
P-value based on T-test. *** <0.01, ** <0.05 and * <0.1

Table 7: Regression results: Willingness to pay for Aquatabs

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Coefficient Estimates						
HIGH Treatment	4.83***	4.79***	4.78***			
	(0.239)	(0.246)	(0.244)			
Aquatab_L				-5.12***	-5.20***	-5.14***
				(0.362)	(0.367)	(0.352)
Storage_H				-0.01	-0.10	-0.01
				(0.415)	(0.410)	(0.395)
Storage_L				-4.98***	-5.09***	-4.97***
				(0.319)	(0.315)	(0.312)
Control_H				-0.61	-0.68	-0.58
				(0.444)	(0.437)	(0.416)
Control_L				-5.02***	-5.10***	-5.01***
				(0.337)	(0.332)	(0.336)
Female HH Head		-0.41	-0.58		-0.31	-0.44
		(0.517)	(0.458)		(0.455)	(0.374)
Presence of Disabled Person in HH		-0.49	-0.12		-0.50	-0.08
		(0.463)	(0.462)		(0.460)	(0.461)
Diarrhoea in the last 2 days		0.16	0.23		0.09	0.18
		(0.332)	(0.346)		(0.319)	(0.333)
Fever in the last 2 days		-0.27	-0.14		-0.25	-0.14
		(0.236)	(0.247)		(0.242)	(0.248)
Education of Mother		-0.02	-0.01		-0.03	-0.02
		(0.028)	(0.027)		(0.026)	(0.025)
Education of Father		0.02	0.01		0.02	0.01
		(0.024)	(0.023)		(0.024)	(0.023)
Household Size		0.05	-0.02		0.05	-0.03
		(0.056)	(0.056)		(0.055)	(0.054)
Landholding		0.00**	0.00***		0.00***	0.00***
		(0.001)	(0.001)		(0.001)	(0.001)
Average Monthly Expenditure		-0.00	-0.00		-0.00	-0.00
		(0.000)	(0.000)		(0.000)	(0.000)
Access to Microfinance Loans		0.23	0.04		0.23	0.02
		(0.186)	(0.169)		(0.184)	(0.166)
Constant	6.72***	6.60***	6.85***	11.76***	11.87***	11.97***
	(0.144)	(0.404)	(0.371)	(0.371)	(0.551)	(0.470)
Panel B: Difference Estimate						
Aquatab_H -Aquatab_L				-5.12***	-5.20***	-5.14***
Storage_H -Storage_L				4.97***	4.99***	4.96***
Control_H -Control_L				4.40***	4.40***	4.40***
$\Delta A - \Delta C$				0.72	0.78	0.71
$\Delta A - \Delta S$				0.15	0.21	0.18
Observations	1,276	1,278	1,278	1,276	1,269	1,269
Village Fixed Effect	N	N	Y	N	N	Y

Notes
*** p<0.01, ** p<0.05, * p<0.1, Clustered Standard Errors. Dependent Variable: Maximum Willingness to Pay.

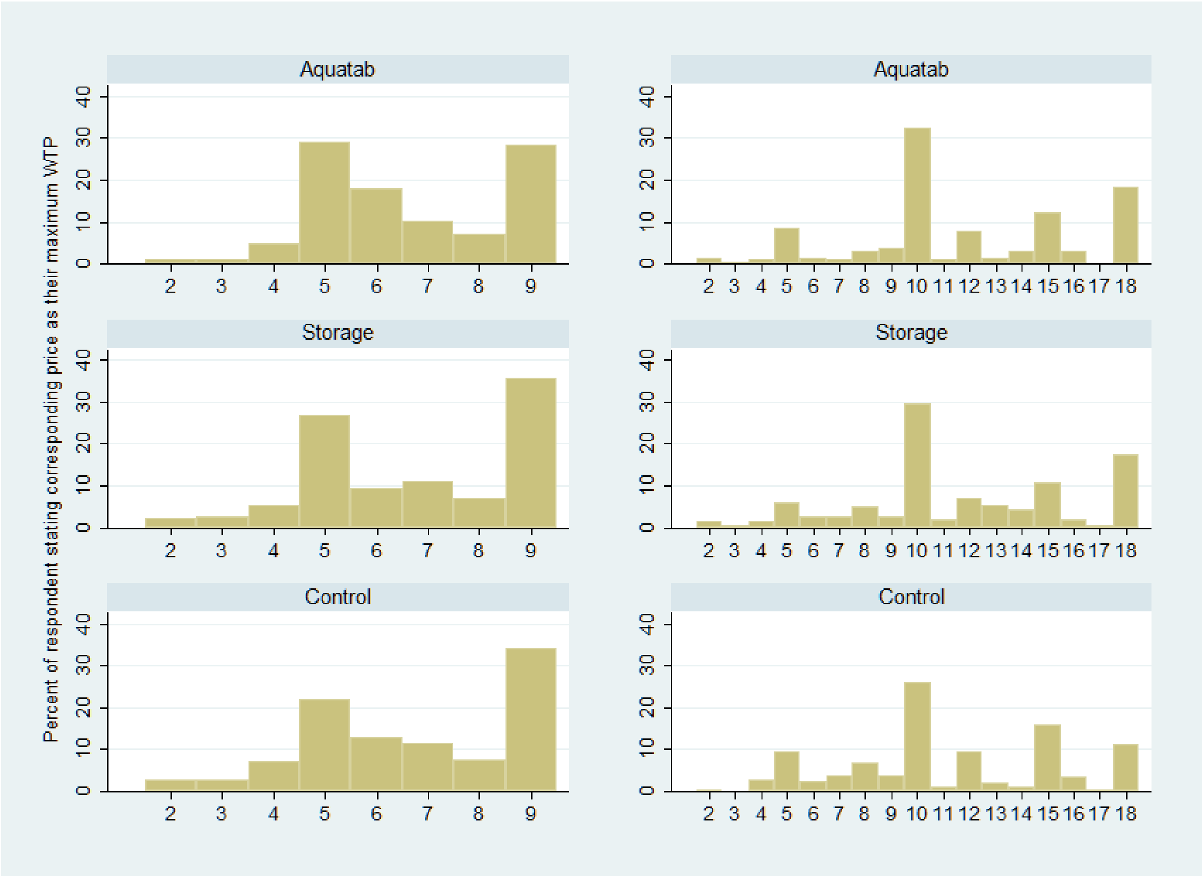
Figure 1 : Distribution of maximum willingness to pay across price treatments.



Notes:

Distributions (after controlling for discount) are statistically significant using a Kolmogorov-Smirnoff test (p-value <0.01).

Figure 2: Distribution of maximum willingness to pay across price treatments and study arms.



Notes:

Distribution Differences using Kolmogorov-Smirnoff test:

Aquatab vs Storage, Low : (p-value = 0.514)

Aquatab vs Control, Low : (p-value = 0.628)

Storage vs Control, Low : (p-value = 1.000)

Aquatab vs Storage, High: (p-value = 1.000)

Aquatab vs Control, High: (p-value = 0.348)

Storage vs Control, High: (p-value = 0.451)

Figure 3: Demand differences across price treatments.

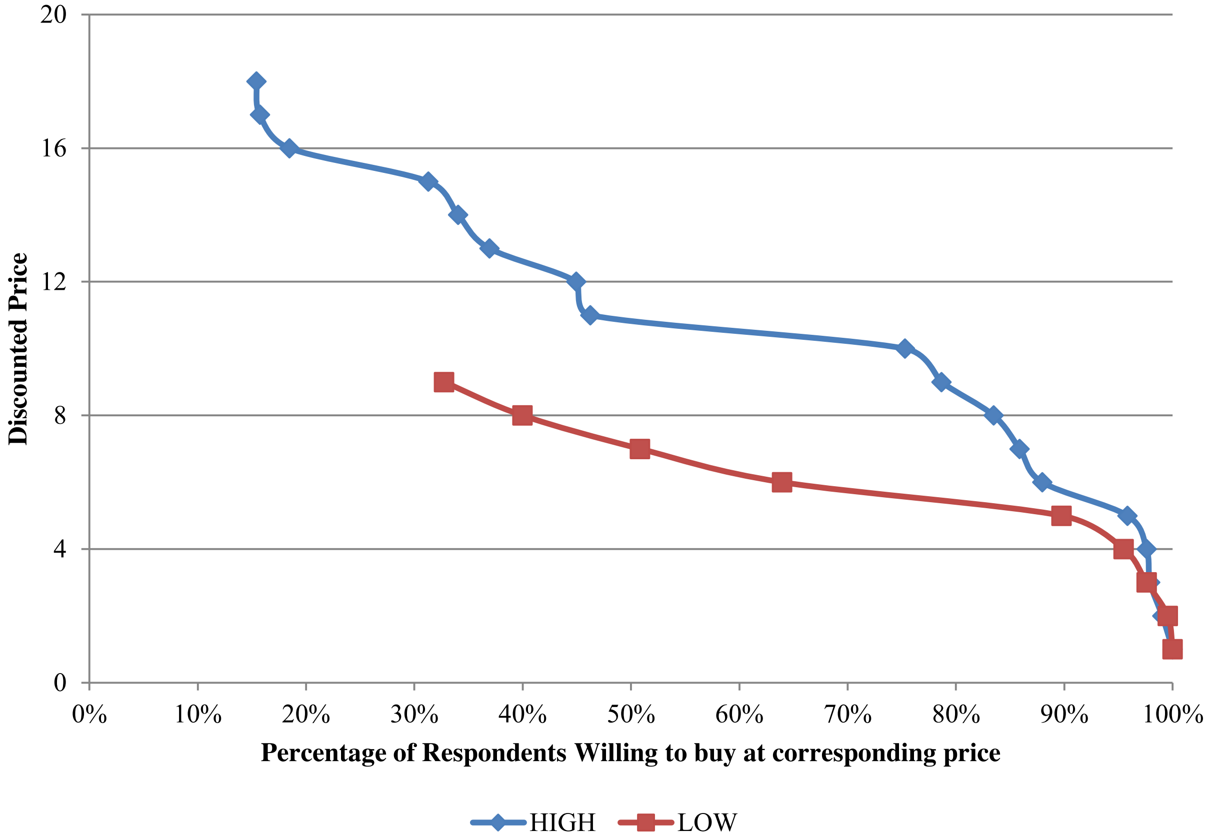


Figure 4: Demand in the LOW price treatment

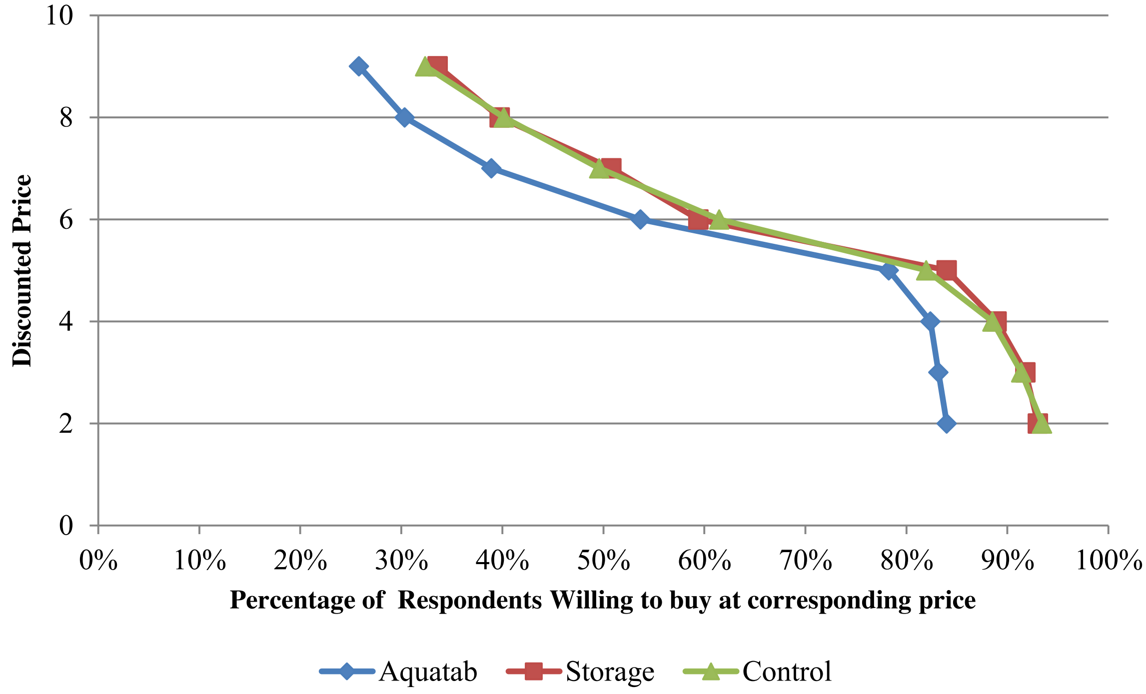
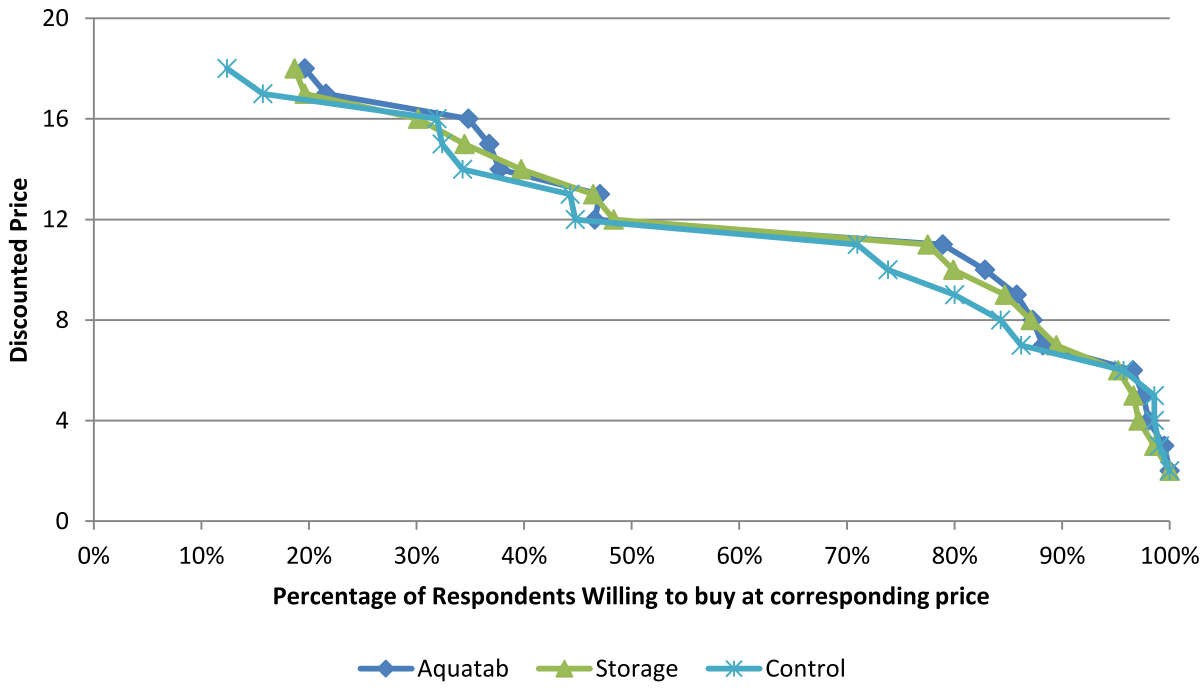


Figure 5: Demand in the HIGH price treatment



Appendix 1: Sample across Treatment and Arms.

	Aquatab	Storage	Control	Total
LOW	244.0	251.0	262.0	757.0
	32.2%	33.2%	34.6%	
HIGH	244.0	248.0	251.0	743.0
	32.8%	33.4%	33.8%	
Total	488.0	499.0	513.0	1500.0

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