

Perceptions of safety and household behaviors to improve drinking water quality in peri-urban Cambodia

Prepared by: Gina Turrini

Master of Public Policy Candidate

The Sanford School of Public Policy

Duke University

Faculty Advisor: Marc Jeuland

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Executive Summary

Policy Question

How do perceptions of water quality affect household water-related hygiene and behavior, and can these perceptions be changed by the provision of household-specific water quality information?

Background

Despite some recent progress, diarrheal disease continues to be a significant cause of illness and death, particularly among children under five years of age (UNICEF 2012; Liu et al. 2012; Jeuland et al. 2013). It has been argued that close to 90% of the deaths due to diarrhea are preventable and caused by a combination of poor water, hygiene, and sanitation (Prüss-Üstün and Corvalán 2006). The location of this particular study, Cambodia, is one example of a country where trends in coverage and diarrhea disease are favorable, but where challenges persist (WHO 2004; DHS 2010).

A wide variety of factors are thought to have contributed to the recent global progress in reducing diarrheal disease, including the expansion of access to improved and piped water and sanitation services (Fink et al. 2011; Jeuland et al. 2013) and low-cost household- and community-level water and sanitation interventions, including hand-washing and hygiene education campaigns, programs to encourage use of latrines rather than open defecation, and the spread of low-cost point-of-use (POU) water treatment products (Waddington et al. 2009). Yet despite increased promotion of low-cost methods for decreasing the risks of diarrhea, demand for and utilization of many such technologies and behavioral changes remains surprisingly modest (Figueroa and Kincaid 2007; Zwane and Kremer 2007; Luby et al. 2008; Pattanayak and Pfaff 2009; Whittington et al. 2012).

The literature is somewhat unclear about the relative importance of barriers to adoption and of the most effective solutions for addressing them. Without large subsidies, infrastructure-centered solutions that aim to reduce the need for POU treatment are often prohibitively expensive for households in developing countries (Whittington et al. 2009). Meanwhile, demand for even low-cost POU technologies has been shown to be limited by budget constraints and lack of knowledge about health issues, the value of prevention, and the safety of the water that households consume (Ashraf et al. 2010; Hamoudi et al. 2012; Jalan and Somanathan 2008).

Several recent studies have considered whether the provision of specific information about a household's own water quality (rather than general information about health and disease prevention) can influence the demand

for higher quality water and health-related behaviors more generally (Hamoudi et al. 2012; Jalan et al. 2008; Madajewicz et al. 2007, Luoto 2009). Collectively, these studies provide some evidence that household behaviors are responsive to such information (Lucas et al. 2011). Still, additional research is needed to better understand the precise mechanisms underlying the impacts of such information.

This study aims to contribute to knowledge about the demand for POU treatment in two ways. First, we implement a randomized information intervention combined with elicitation of subjective perceptions of water quality to investigate whether and how the supply of household-specific information affects household perceptions about the safety of their own drinking water. Second, we consider the effect of household perceptions of drinking water safety on a set of behaviors – either through increased purchase and use of a chlorine-based product called Aquatabs that was sold directly to households, or through changes in other preventive water-related behaviors. A random (exogenous) information treatment is required to isolate the effect of perceptions on behavior because perceptions and drinking-water behaviors are likely related to many of the same unobservable factors.

Methodology

A major challenge facing studies of the link between perceptions of drinking water safety and the demand for improved water quality is that many of the same factors influence both perceptions of water quality and households' water and sanitation preferences, and not all of those factors are observable. Given the complexity of the relationship between the underlying and unobserved drivers of both perceptions and demand, researchers simply observing the direct relationship between perceptions and demand for water treatment might misinterpret the extent to which perceptions actually drive behaviors.

Our identification strategy for isolating the effects of perceptions on demand therefore hinges on the provision of an exogenous “shock” to household perceptions of water safety. This shock is implemented via the exogenous (randomized) delivery of household-specific water quality information to a sub-sample of survey households. The information shock that comes from providing water quality test results to a randomly selected half of the households in our sample then serves as an instrumental variable for perceptions of water safety.

To better assess the degree to which perceptions of water safety drive demand for such preventive behaviors, we use a two-stage least-squares model. The first stage equation allows a test of the hypothesis that the supply

of household-specific water quality information shifts perceptions of water safety, while the second looks at how changes in perceptions relate to the household behaviors of interest.

Though the study was originally conceived to test the demand for Aquatabs, a chlorine-based disinfectant, we do consider outcome variables that correspond to a much wider set of preventive water-related behaviors (these were also mentioned to respondents as ways of protecting against the risks accompanying consumption of contaminated water). Specifically, we assess the degree to which households shift their water sourcing, handling and storage of drinking water, as well as overall water treatment, as a result of the information and/or their perceptions of water safety. Inspection of this wider set of outcomes allows us to consider whether households view such preventive behaviors to be complements or substitutes. In addition, if households purchase some Aquatabs and then decide they do not like them because of poor taste, they may still benefit from enhanced information on contamination by adopting a different method of ensuring their water is safe.

Data

Data for this project comes from three waves of panel data from 915 households in peri-urban Cambodia. The first wave was conducted in 2011 while the second and third took place in 2012. For this analysis, we will be focusing primarily on the last two rounds of data collection. During all three waves, households were asked about diarrhea incidence; household characteristics; a number of water sourcing, storage, handling, and treatment practices; and their perceptions of the safety of their own water.

During the second visit, all households had their drinking water tested for e.coli contamination. A randomly selected half of the households were given the results of this water test before being asked about their perceptions of the safety of their water. All households were given the opportunity to purchase a chlorine-based water treatment product called Aquatabs. Six weeks later, in the third visit, all households were revisited. In this final survey, many of the same questions were asked once more, in addition to questions about whether they used their chlorine tablets and if they changed any of their water-related behaviors.

Results and Discussion

This paper looks at the use of a randomized information intervention to isolate the effect of perceptions of water safety on the demand for water-related preventive behaviors. We first assessed the effect of water quality information on perceptions of water safety, finding that evidence of contamination significantly

decreased perceptions of water safety, whereas the opposite result tended to increase these perceptions, at least among literate households. Still, the explanatory power of the model estimating perceptions was relatively modest, which is perhaps not surprising, given that perceptions were measured on an integer scale, and given the considerable heterogeneity in perceptions and the factors that drive them across the sample. Indeed, many of these drivers are endogenous to perceptions and demand for preventive water-related behaviors, and therefore were omitted from the first-stage model.

We then used the exogenous information shock as an instrument for estimating the influence of such perceptions on demand for a chlorine-based water treatment product and a variety of other water-related preventive behaviors. We found that households with better perceptions of the safety of their water bought fewer Aquatabs and were less likely to engage in behaviors to make their water safe, such as overall water treatment or collection of water from higher quality sources. On the other hand, households with worse perceptions of their water safety were more likely to engage in a variety of these behaviors.

Taken together, these results suggest that perceptions play an important role in the demand for water treatment products and in the willingness of households to engage in time-consuming and costly behaviors to ensure that their water is safe. These results lend additional credibility to previous findings in the literature that giving households tailored and salient information on water quality does affect short-term preventive behaviors that have been shown to deliver health benefits (Jalan and Somanathan 2008; Hamoudi et al. 2012).

Nonetheless, a number of important questions related to the link between information, perceptions and behaviors remain. As we discuss in this paper, water safety perceptions are highly varied and result from long experience in communities and settings about which researchers and public health practitioners will have little knowledge. There is a need for more long-term research on the factors that lead to the formation of sometimes erroneous perceptions about water quality, and on the extent to which information campaigns can effectively alter misperceptions (and behaviors) in the long term. Another fruitful area of research concerns the heterogeneity of responses to information, and whether these vary according to observable characteristics (e.g. income) of households and those exposed to the information.

Introduction

Despite some recent progress, diarrheal disease continues to be a significant cause of illness and death, particularly in Asia and Africa and among children under five years of age (UNICEF 2012; Liu et al. 2012; Jeuland et al. 2013). It has been argued that close to 90% of the deaths due to diarrhea are preventable and caused by a combination of poor water, hygiene, and sanitation (Prüss-Üstün and Corvalán 2006). The location of this particular study, Cambodia, is one example of a country where trends in coverage and diarrheal disease are favorable, but where challenges persist. Diarrhea causes thousands of deaths each year in Cambodia (WHO 2004), and the most recent Demographic and Health Survey report estimated 15% of children under five experienced diarrhea in the two weeks preceding the survey (DHS 2010). This disease burden is concentrated among the 80% of Cambodians living in peri-urban or rural areas and among less educated households (DHS 2010; WHO 2004).

A wide variety of factors are thought to have contributed to the recent global progress in reducing diarrheal disease, including the expansion of access to improved and piped water and sanitation services (Fink et al. 2011; Jeuland et al. 2013) and low-cost household- and community-level water and sanitation interventions, including hand-washing and hygiene education campaigns, programs to encourage use of latrines rather than open defecation, and the spread of low-cost point-of-use (POU) water treatment products (Waddington et al. 2009). Yet despite increased promotion of low-cost methods for decreasing the risks of diarrhea, demand for and utilization of many such technologies and behavioral changes remains surprisingly modest (Figueroa and Kincaid 2007; Zwane and Kremer 2007; Luby et al. 2008; Pattanayak and Pfaff 2009; Whittington et al. 2012). This is particularly problematic given that low compliance, as a result of using POU methods inconsistently, incorrectly, or for only a short time, for instance, can reduce the effectiveness of these interventions significantly (Brown and Clasen 2012).

The literature is somewhat unclear about the relative importance of barriers to adoption and about the most effective solutions for addressing them. Without large subsidies, infrastructure-centered solutions that aim to reduce the need for POU treatment are often prohibitively expensive for households in developing countries (Whittington et al. 2009). Meanwhile, demand for even low-cost POU technologies has been shown to be limited by budget constraints and lack of knowledge about health issues, the value of prevention, and the safety of the water that households consume (Ashraf et al. 2010; Hamoudi et al. 2012; Jalan and Somanathan 2008). Previous work with households in the same peri-urban communities in Cambodia as this study, for instance, suggests that there is little correlation between perceptions of water quality and actual counts of *E. coli* in

households' drinking water (Orgill et al. 2012). In addition, survey households tend to be sensitive to the taste problems and inconvenience associated with inexpensive and effective water treatment technologies such as chlorination (Arnold and Colford 2007; Jeuland et al 2012).

Several recent studies have considered whether the provision of specific information about a household's own water quality (rather than general information about health and disease prevention) can influence the demand for higher quality water and health-related behaviors more generally (Hamoudi et al. 2012; Jalan et al. 2008; Madajewicz et al. 2007, Luoto 2009). Collectively, these studies provide some evidence that household behaviors are responsive to such information (Lucas et al. 2011). Still, additional research is needed to better understand the precise mechanisms underlying the impacts of such information. For example, it is possible that households do not fully understand risks of consuming untreated water, and that salient information indicating possible contamination may influence their perceptions of its safety. On the other hand, changes in behavior may not stem from the information content of water quality test results at all, but rather come from survey respondents' interactions with enumerators or sales people armed with water quality tests. In addition, the persistence of the effects of information over time remains very much unknown. This is important in light of recent findings that suggest that experience with POU treatment may in fact reduce demand (Luoto et al. 2012; Luoto et al. 2008).

This study aims to contribute to knowledge about the demand for POU treatment in two ways. First, we implement a randomized information intervention combined with elicitation of subjective perceptions of water quality to investigate whether and how the supply of household-specific information affects household perceptions about the safety of their own drinking water. Second, we consider the effect of household perceptions of drinking water safety on a set of behaviors – either through increased purchase and use of a chlorine-based product called Aquatabs that was sold directly to households, or through changes in other preventive water-related behaviors. A random (exogenous) information treatment is required to isolate the effect of perceptions on behavior because perceptions and drinking-water behaviors are likely related to many of the same unobservable factors.

This paper is organized as follows. The next section presents the modeling framework, followed by a description of the data in Section 3. Results are presented in Section 4, followed by a discussion in Section 5.

Model

A major challenge facing studies of the link between perceptions of drinking water safety and the demand for improved water quality is that many of the same factors influence both perceptions of water quality and households' water and sanitation preferences, and not all of those factors are observable. For instance, households that care more about health or cleanliness, for whatever reason, may spend more time and effort treating their water, and therefore may be more confident about its safety. The basis for such concerns may not be fully observed by researchers. On the other hand, households that either do not care so much about health or that have low awareness of problems caused by contaminated water may believe their water is safer than it really is. Given the complexity of the relationship between the underlying and unobserved drivers of both perceptions and demand, researchers simply observing the direct relationship between perceptions and demand for water treatment might misinterpret the extent to which perceptions actually drive behaviors.

Our identification strategy for isolating the effects of perceptions on demand therefore hinges on the provision of an exogenous "shock" to household perceptions of water safety. This shock is implemented via the exogenous (randomized) delivery of household-specific water quality information to a sub-sample of survey households. The information shock that comes from providing water quality test results to a randomly selected half of the households in our sample then serves as an instrumental variable for perceptions of water safety. This section presents the general econometric framework for carrying out this analysis.

We begin with a reduced form model linking the exogenous information assignment to demand for improved water quality, similar to that presented in Hamoudi et al. (2012) but controlling for additional factors related to behaviors that protect against water contamination:

$$Y_i = \alpha + \beta_1 T_i + \beta_2 P_i + \beta_3 X_{1i} + \varepsilon_i, \quad (1)$$

where Y_i is the behavior of interest (e.g., demand for Aquatabs; other forms of water treatment; or improved water handling, storage, or hygiene behaviors), T_i is the information status of the household, P_i is a measure of perceptions of water safety, and X_{1i} is a vector of other control variables related to the outcome of interest. The coefficients α and β_k are estimated using regression methods, and ε_i is a household-specific error term. The treatment variable takes a value of 1 if the household was in the group of households that received water quality test results, and a value of 0 otherwise. The other covariates included in X_{1i} include household and respondent characteristics such as age, education, satisfaction with current water supplies, and socioeconomic

indicators. In other words, this first model considers how exposure to information about water contamination impacts households demand for improved water quality, controlling for perceptions and other factors. Thus, while it may help to answer the question of how provision of information affects behavior, it does not assess the degree to which that information may affect water quality perceptions or may be linked to the decision to adopt preventive health behaviors. It also ignores the potential endogeneity between perceptions and behaviors highlighted above. Comparing these results to what we get with a two-stage model can give us some idea of the size and direction of possible bias present in the single-stage model as a result of correlation between perceptions and the error term.

We also include a surveyor fixed effect, since it seems plausible that some enumerators were systematically better at sales of Aquatabs than others, or of convincing households to adopt other preventive water-related behaviors. By including dummies for each enumerator, we can account for the potentially confounding effect of enumerator sales and persuasive skill.

To better assess the degree to which perceptions of water safety drive demand for such preventive behaviors, we use a two-stage least-squares model. The first stage equation allows a test of the hypothesis that the supply of household-specific water quality information shifts perceptions of water safety. Specifically, we use the information assignment to explain water quality perceptions:

$$P_i = \kappa + \gamma_1 T_i + \gamma_2 X_{2i} + \nu_i, \quad (2)$$

where X_{2i} is a vector of other variables that affect perceptions. The coefficients κ and γ_k are again estimated using regression methods, and ν_i is a household-specific error term. The second stage then uses the predicted values of perceptions of water quality \hat{P}_i obtained from equation 3 below to explain the demand for preventive health behaviors related to water (equation 4):

$$\hat{P}_i = \kappa + \gamma_1 T_i + \gamma_2 X_{2i}, \quad (3)$$

$$Y_i = \alpha' + \beta_1 \hat{P}_i + \beta_2 X_{3i} + \eta_i, \quad (4)$$

where all variables are defined as above, and the coefficients α' and β_k in equation 4 are again estimated using regression methods. It is important to note that the instrumental variables we include in the first stage model must not be correlated with the error term for demand in the second stage to be valid. Since the information treatment was assigned randomly, it should be uncorrelated with such unobservable factors, and we conduct a

series of balance tests to assess whether the randomization was successful. Other covariates we include in the first-stage explanation of perceptions are respondent characteristics that are not significant in the single-stage model (equation 1), or that seem likely to work primarily through perceptions of water safety, for example respondent literacy, which relates to the ability to comprehend the test results and accompanying water quality information. In the second stage regression, we include the same covariates that we believe may influence demand for preventive water-related behaviors as in equation 1, with the exception of those moved to stage one.

Though the study was originally conceived to test the demand for Aquatabs, a chlorine-based disinfectant, we do consider outcome variables that correspond to a much wider set of preventive water-related behaviors (these were also mentioned specifically to respondents as ways of protecting against the risks accompanying consumption of contaminated water). Specifically, we assess the degree to which households shift their water sourcing, handling and storage of drinking water, as well as overall water treatment, as a result of the information and/or their perceptions of water safety. Consideration of this wider set of outcomes allows us to consider whether households consider such preventive behaviors to be complements or substitutes. In addition, if households purchase some Aquatabs and then decide they do not like them because of poor taste, they may still benefit from enhanced information on contamination by adopting a different method of ensuring their water is safe.

Data

The data used for this project were collected in three waves - one during the summer of 2011 (baseline) and two (rounds 1 and 2) during the summer of 2012. The analyses described in this paper largely focus on data collected during rounds 1 and 2.

Baseline

Baseline information on 915 households in two communes in peri-urban Cambodia was collected during an initial round of data collection in 2011 (Orgill et al. 2012). These two communities were selected based on several criteria, including proximity to Phnom Penh (for water testing purposes), sufficient size to ensure statistical power, some reliance on piped water and widespread access to convenient water supplies, and sufficiently high prevalence of diarrhea to suggest that an intervention to improve water quality could be valuable.

During the baseline, information was collected from a random sample of households in the two selected communes by counting off every 5th household. The survey instrument included questions on basic demographics of the family; water sources, treatment, and storage; diarrhea incidence; willingness to pay for access to improved water; preferences for various attributes of water sources such as taste and cleanliness; and the households' own perceptions of the safety of their water. These questions, particularly those relating to the willingness to pay (WTP), perceptions, and preferences, were developed after conducting focus groups and pretesting the survey in another, similar community located nearby. In addition, a limited number of water samples were collected in the households that had working piped connections, and tested for *E. coli* in Phnom Penh. The design and results from the WTP and other preference analyses conducted following the baseline survey are discussed elsewhere (Orgill et al. 2012; Jeuland et al. 2012). For the purpose of this paper, however, it should be noted that these analyses provided suggestive evidence that perceptions of water safety do influence demand for improved water quality.

Round 1

Round 1 took place in late May and early June of 2012. At that time, a new team of enumerators returned to resurvey the households interviewed during the previous summer, and to implement the information experiment. Between baseline and round 1, 63 households were lost from the original sample (about 7%). Roughly half of the attrition was due to families moving away, while the other half could not be located due to missing or inaccurate GPS and address information. Households lost from the sample tended to be younger, smaller, and poorer than households that were retained (see Appendix for details).

Many of the questions asked during round 1 were identical or similar to those asked at baseline, including questions on household demographics; diarrhea prevalence; water sources, treatment, and storage; and perceptions of household water quality. The primary change between baseline and round 1 was the elimination of the WTP and other preference activities, and the addition of household water quality testing and a sales script developed to sell Aquatabs. Baseline households were randomly assigned to either the water quality information treatment or control groups prior to round 1, and statistical tests were conducted to ensure balance across the two arms of the experiment, in terms of baseline characteristics and outcomes.

As part of the round 1 interview, enumerators collected, labeled, and kept in pre-prepared H₂S test vials one sample of water from the main (untreated) drinking water source used by all households – treatment and control – in the sample. These vials contain H₂S test strips produced by Research Development International-Cambodia (RDI-C), which react to the presence of hydrogen-sulfide producing bacteria, by turning brown or

black. These tests do not produce a quantitative measure of bacterial contamination, nor do they indicate the true severity of the risks associated with consuming a particular water sample. Nonetheless, they are easy to use, simple to interpret, do not require special equipment, and can be left at room temperature.

In addition to the test vial collected from all households by enumerators, households in the treatment group were given two additional H₂S test vials. The first of these was filled in exactly the same way as the vial kept by the survey team, while the second was filled with a sample of the same water treated with Aquatabs, to demonstrate the effectiveness of this product.¹ Enumerators then returned to treatment households two days later to check the samples, discuss the results, and measure perceptions of water safety. To measure perceptions of drinking water safety, we followed the procedure used during the baseline survey and described in Orgill et al. (2012). Respondents were told to divide 10 candies between two circles, one labeled as “safe” and the other labeled as “unsafe,” based on their perceptions of their water’s safety. Respondents completed this activity first for their drinking water at the time of collection from the source. They were then asked to repeat it while considering their water just before they drank it, after any treatment, handling, or storage. We use the responses to these questions to assign a perception score ranging from 0 to 10 to each household for source and drinking water.

After answering the perceptions questions, the households in the information treatment group received additional information about what the test results meant – with emphasis on the fact that a positive (black) H₂S test indicating contamination does not necessarily indicate that people consuming similar water will become sick. Respondents were then told about water handling, treatment, and storage behaviors that could help them protect against water contamination. These included getting their water from a safer source, treating their water, avoiding touching water with their bare hands, covering water containers, cleaning storage vessels with soap, avoiding storing water for days at a time, keeping water containers away from children, and regular hand-washing with soap.

At the end of the interview, enumerators attempted to sell strips of Aquatabs (each strip contains 10 tablets which each treat 20 liters of water) to all households for 500 Riel (US\$0.12) per strip, using a sales script developed in collaboration with social marketing specialists at Watershed-Cambodia, and pre-tested in focus groups and pilot surveys (see Appendix for the full script). Enumerators recorded how many strips households purchased and gave all buyers an envelope to keep the packaging for verification purposes during round 2 (with

¹ Disinfection requires time, so treatment households were asked to produce a sample of their untreated drinking water at the very beginning of the interview for treatment, such that the vial with treated water could be filled 30 minutes later.

the promise of receiving a free gift if they kept the packaging). Thus, control households answered questions related to perceptions and were offered Aquatabs during the initial visit, and did not observe the test result or receive information about behaviors for reducing the risks of consuming contaminated water. Most of the survey households had previously heard of Aquatabs, but had not tried them personally. Aquatabs is promoted in Cambodia by Population Services International but was only available in very limited quantities in Ang Snoul at the time of the survey.

Round 2

In round 2, we returned to households roughly six weeks after round 1. Between round 1 and round 2, six households (<1%) moved and could not be re-interviewed. During these follow-up visits, we asked many of the same questions about household health and water and sanitation behaviors. Enumerators repeated the perceptions exercise and filled another H₂S test vial with a sample of source water. They also took a sample of water treated by Aquatabs if the household had it on hand. In round 2, the enumerators again attempted to sell additional Aquatabs to all households. They also checked if treatment households accurately remembered their test results, and asked all households how many Aquatabs they had purchased (correcting them if they gave the wrong response), asked them how many they had used, and checked the packaging of used strips for verification.

Additional details

As presented in the previous section, the modeling of demand for improved water quality conducted in this paper controlled for a range of socio-economic characteristics. Unfortunately, many households were unwilling to answer sensitive questions related to income (n=54) and/or expenditures (n=176). Those who refused to answer such questions also appear to be systematically different from respondents who did. For example, households who said they did not know their total monthly expenditures tended to have better perceptions about the safety of their water, and bought fewer Aquatabs. Therefore, in order not to lose sample size and generate biased results, and because income was less precisely measured in our survey than expenditures, we predicted monthly expenditures as a function of asset ownership and property ownership status (see Appendix for additional details and model estimates). We then use the predicted values of total expenditures in the analyses of the demand for Aquatabs and for other preventive water-related behaviors.

Results

Household characteristics, water quality perceptions, and water-related behaviors

The characteristics of households interviewed in rounds 1 and 2 are presented in Table 1. The average household in our sample had two children and most respondents (71%) were women with an average age of 44 and with 5.4 years of education. Approximately 27% of households had at least one member who had experienced diarrhea in the previous two weeks, including roughly 6% of children under the age of 18. The vast majority of households in the sample believed that diarrhea can be prevented (98%), although only 80% list contaminated water as a possible cause of diarrhea. Most households primarily used surface or rain water during the rainy season (86%) and were generally satisfied with the taste and smell of their water (93%). A large majority of households (80%) reported doing something to treat their water, and 87% of households' had a positive test for source water contamination based on the results of the H₂S tests. For the most part, these results did not change significantly between rounds 1 and 2. One exception is the number of households with at least one member who experienced diarrhea in the past two weeks, which decreased from 27% to 11% between rounds.

Consistent with these results that suggest low source water quality and a high prevalence of water treatment among households, respondents reported low confidence in the safety of their source water, giving it on average a 3.3 out of 10. Respondents had much greater confidence in the safety of their water once they drink it, however (giving it a 9.3 out of 10).

Balance check

To test for balance across treatment and control households, we implemented two types of tests for balance across the study arms, using the data collected at baseline. Our first approach is the method researchers typically use for assessing differences between treatment and control groups, by comparing the means of variables of interest using t-tests or regression methods. Using this approach, across the 138 variables included in the balance tests, we find 9 to be statistically significantly different at the 10% level, which is roughly what would be expected due to chance. In particular, we find that treatment households had fewer tractors; were more likely to list eating food touched by flies, not washing hands, and eating raw foods as causes of diarrhea; were less likely to report that too much food causes diarrhea; had lower chlorine concentrations in their water samples at baseline; had more children in their household; were less likely to have a separate kitchen; and were more likely to report using soap after defecation.²

² The full list of variables assessed in these balance tests is presented in the Appendix (Table A4).

As indicated above, simple means comparisons are problematic, however, given that running a large number of t-tests on the same data is likely to produce significant results simply by chance. In order to decrease the probability of such type 1 errors of inference (called the false discovery rate, or FDR), we decrease the number of statistical comparisons by grouping like variables into families (e.g., assets or water treatment practices) and implementing an adjustment for multiple inference to obtain relevant q-values (Benjamini and Hochberg 1995; Anderson 2008). This q-value is the smallest level at which the hypothesis would be rejected, and can be thought of as a critical value. After implementing this procedure, we find that almost all the outcomes that were significant using “naive” p-values become insignificant, with the exception of lower ownership of tractors among treatment households (Table 2). Though households with tractors appear to have lower expenditures than others (perhaps because they are more rural and produce some of their own food; see Table A4), we see no differences in terms of other assets or farm animals.

Single-stage model with perceptions and information treatment status

This section presents results from the single-stage model that treats both the information treatment status and perceptions of water safety as exogenous to the demand for water-related preventive behaviors. For a variety of outcomes, we run the same regression with the full sample first, and then split the sample into two groups: those who had a positive (black) H₂S test result, and those who had a negative result. Table 3 presents the results for the purchase of Aquatabs, including all control variables included in the model; Table 4 then summarizes the results for a variety of other outcomes (water treatment, storage, and sources, for instance).

As shown in Table 3, we find that for all sub-samples and the full sample, higher perceptions of water quality is negatively associated with the number of Aquatabs purchased. Though the size of the coefficient is similar in all three samples, it is only statistically significant for the full sample. In addition, older respondents tended to buy fewer Aquatabs (full sample only), and women bought fewer Aquatabs (full sample and among those testing positive for contamination), while households with higher expenditures bought more Aquatabs (full sample and among those testing positive for contamination).

We next consider whether any of the behaviors related to water sourcing and treatment, storage of water, and hygiene practices changed as a result of the information experiment. Households that bought Aquatabs in round 1, for instance, reported in round 2 that they were less likely to boil their water and were more likely to use a chemical treatment product. Most of our coefficients on perceptions and treatment are not significant, perhaps due in part to being correlated with whether households purchased Aquatabs in round 1. The one

exception is that households with higher perceptions were more likely use open defecation and households in the treatment group were less likely to boil their water. As we will see below, model coefficients for perceptions are larger and more highly significant in the two-stage model, suggesting that the endogeneity of perceptions leads to downward bias in estimates from the single-stage model.

Two-stage model with information treatment status as an instrumental variable for perceptions

We next consider the two-stage model results, again considering the three different samples used above. We find that the first-stage results are very similar for the full sample and among the households with a positive water test (not surprisingly, since 87% of the sample had a positive result) (Table 5). Among these two groups, households receiving the information treatment, those with literate respondents, those living in the commune of Ang Snoul, and those with feces observable in their living area all have lower perceptions of the safety of their drinking water. Though these covariates are all statistically significant, they have fairly low explanatory power. This is perhaps not surprising, given that perceptions are measured on an integer scale, and given the considerable heterogeneity in perceptions and the factors that drive them across the sample.

Results are very different for the few households receiving a clean water result. Among these households, being in the treatment group was not significantly associated with any change in perceptions of water safety, but the interaction between respondent literacy and information treatment is highly significant. Those households with a literate respondent who received a clear test result have an average *increase* in their perception of their water's safety of 2.4. Given that this is on a scale of 0-10 and the average response was only slightly more than 3, this is a very large change in perceptions. These results also lend credence to the idea that water quality information affects perceptions in the expected way. On the other hand, consistent with the other samples, respondent literacy in the absence of information and residence in Ang Snoul are significantly related to lower perceptions of water safety.

In the second stage of the model, we use predicted perceptions from the first stage to study the demand for Aquatabs and other protective water-related behaviors. We consider two different specifications, depending on the outcome variable: The first (for continuous outcomes) is an OLS regression; the second (for binary outcomes) is a logit in which the dependent variable indicates whether the household engaged in a particular behavior. Both models also include enumerator fixed effects in the second stage.

Considering the demand for Aquatabs, for both the full sample and the subsample with a positive test result, the coefficient on predicted perceptions is negative and significant, suggesting that households who have more

confidence in the safety of their water purchase fewer Aquatabs (Table 6). The results are similar to those obtained from the single stage model; however, the coefficients on perceptions are much larger in the two-stage model. This suggests a downward bias in the measured effect of perceptions on demand due to correlation between perceptions and the error term in the demand equation. In addition, female respondents bought fewer Aquatabs (sub-sample with contaminated water), and households already treating their water also bought fewer Aquatabs (full sample). Finally, households not in the bottom quartile for expenditures bought more Aquatabs. In the sample of households with clear water samples, however, the coefficient on predicted perceptions is insignificant, and none of the other covariates are significantly related to demand.

With a logit specification for the purchase of any Aquatabs, the coefficients on perceptions and other control variable are no longer statistically significant although the coefficients remain negative (Table 6). This suggests that outliers may be having a sizeable effect in the previous model. It is also possible that the influence of changes in perceptions caused by the water quality test information is to push households to buy more Aquatabs than they ordinarily would, rather than convincing households who would not ordinarily buy them to do so. In addition, one potential concern with our identification of the effect of perceptions might be that the other control variables in stage 1 – particularly respondent literacy and residence in Ang Snoul – may lead to the same endogeneity problems with predicted perceptions that affect the single-stage model. In order to assess whether the inclusion of those variables in stage 1 affects our final estimates, we also re-estimate the two-stage model with the information treatment as the sole instrument for perceptions. The results from these models do not change substantially, though standard errors increase and higher perceptions are significantly related to greater probability of purchasing Aquatabs in these models (Table 7).

Turning to the other protective behaviors considered above, we find that households make other adjustments as a result of the changes in their perceptions induced by the water quality test information. In the two-stage analysis, we again use predicted perceptions based on the models previously presented in Table 5. We also control for the purchase of Aquatabs in Round 1, using enumerator fixed-effects (sales ability) as an instrument to address the endogeneity of purchases of Aquatabs (for details on this model, see Appendix Table A6).

The first behavior we consider is water source in round 2. We find that households with better perceptions in round 1 are less likely to use piped water in round 2 (Table 8 column 1). Similarly, we see that households with better perceptions in round 1 were less likely to change water sources between rounds. These significant results for the effect of perceptions, however, do not remain in the simple IV analysis with information treatment alone, suggesting that access to piped water (and other sources) is somehow associated with literacy and

community in a way that demand for Aquatabs was not. Households above the bottom quartile of expenditures (in round 1) are also much less likely to use piped water and to have switched water sources between rounds.

Next, we consider household water treatment (Table 8 columns 3 through 6). Interestingly, perceptions do not seem significant in predicting whether households boil their water or whether they use a chemical water treatment product. Households that bought Aquatabs in round 1 are, however, more likely to report using a chemical water treatment product in round 2 and to clean their water storage containers more frequently in round 2 but are not more likely to report boiling their water. For water storage, perceptions are not significantly related to the duration of storage, but households with higher perceptions did clean their water storage containers less frequently in round 2. Increased frequency of cleaning household water storage containers may help preserve water quality, since recontamination often occurs between treatment and use during extended storage times, which increase the possibility for contaminants to enter treated water. We also consider two hygiene behaviors: use of soap and the practice of open defecation. For soap we count the number of uses the household listed. We find that households with higher perceptions listed fewer uses for soap. However, households with higher perceptions in round 1 are more likely to practice open defecation in Round 2.³

Discussion

This paper described the use of a randomized information intervention to isolate the effect of perceptions of water safety on the demand for water-related preventive behaviors. We first assessed the effect of water quality information on perceptions of water safety, finding that evidence of contamination significantly decreased perceptions of water safety, whereas the opposite result tended to increase these perceptions, at least among literate households. Still, the explanatory power of the model estimating perceptions was relatively modest, which is perhaps not surprising, given that perceptions were measured on an integer scale, and given the considerable heterogeneity in perceptions and the factors that drive them across the sample. Indeed, many of these drivers are endogenous to perceptions and demand for preventive water-related behaviors, and therefore were omitted from the first-stage model.

We then used the exogenous information shock as an instrument for estimating the influence of such perceptions on demand for a chlorine-based water treatment product and for a variety of other water-related

³ Using the same data to look at such a large number of likely correlated outcomes again suggests the need for testing of significance using a framework for multiple inference. To investigate this, groups of coefficients were created, one for perceptions and one for whether households bought Aquatabs in Round 1. All significant results described above remain significant after this adjustment (see Tables A7 and A8 in the Appendix for results).

preventive behaviors. We found that households with better perceptions of the safety of their water bought fewer Aquatabs and were less likely to engage in behaviors to make their water safe, such as overall water treatment or collection of water from higher quality sources. Conversely, households with worse perceptions of their water safety were more likely to engage in a variety of these behaviors.

Taken together, these results suggest that perceptions play an important role in the demand for water treatment products and in the willingness of households to engage in time-consuming and costly behaviors to ensure that their water is safe. Our results offer several insights that are relevant for the promotion of public health in places where water supplies may be contaminated. First, these results lend additional credibility to previous findings in the literature that giving households tailored and salient information on water quality does affect short-term preventive behaviors that have been shown to deliver health benefits (Jalan and Somanathan 2008; Hamoudi et al. 2012). Second, the provision of information coupled with marketing of specific water treatment products or public health interventions can significantly increase adoption while reducing the financing burden of those interventions, if households become more likely to purchase the marketed technologies.

Nonetheless, a number of important questions related to the link between information, perceptions and behaviors remain. As we discuss in this paper, water safety perceptions are highly varied and result from long experience in communities and settings about which researchers and public health practitioners will have little knowledge. There is a need for more long-term research on the factors that lead to the formation of sometimes erroneous perceptions about water quality, and on the extent to which information campaigns can effectively alter misperceptions (and behaviors) in the long term. Another fruitful area of research concerns the heterogeneity of responses to information, and whether these vary according to observable characteristics (e.g. income) of households and those exposed to the information. For example, if only richer households choose to purchase new water treatment technologies, then the negative health effects of poor water quality, which primarily affect poorer households, may persist.

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Tables and figures

Table 1. Baseline characteristics for surveyed households

	Round 1			Round 2		
	Mean	Standard deviation	Observations	Mean	Standard deviation	Observations
<i>Demographic variables</i>						
Respondent age	44.1	14.84	841	43.9	15.36	840
Respondent literacy	0.72	0.45	841	0.68	0.47	840
Respondent gender (1=male, 2=female)	1.71	0.46	846	1.74	0.44	839
Number of children	1.87	1.34	849			
<i>Socioeconomic indicators</i>						
Number of rooms in household	0.98	1.03	849	1.01	1.07	834
Number of tractors	0.07	0.35	849	0.06	0.24	840
Number of cows	1.39	2.02	849	1.40	2.77	841
Total monthly expenditures (riel)	2.3e+06	4.0e+07	671	3.0e+06	3.9e+07	568
<i>Diarrhea</i>						
Diarrhea in past two weeks	0.27	0.44	835	0.11	0.32	835
Child diarrhea prevalence	0.06	0.19	714			
Believes diarrhea can be prevented	0.98	0.13	829			
Lists dirty water as a cause of diarrhea	0.80	0.40	849			
<i>Perceptions and Preferences</i>						
Safety of water at source (0-10)	3.33	2.88	848	3.56	2.87	815
Safety of water after handling (0-10)	9.25	1.42	848	9.51	1.09	836
Likes the taste and smell of their water	0.93	0.26	849	0.95	0.21	842
<i>Water Quality</i>						
Percent of households positive for H ₂ S	0.87	0.34	848	0.84	0.37	842
<i>Water treatment and sanitation</i>						
Treats water in some way	0.84	0.37	845	0.85	0.35	840
Currently boiling their water	0.68	0.47	845	0.72	0.45	841
Primarily uses piped water	0.08	0.27	849	0.06	0.24	842
Primarily uses rain or surface water	0.86	0.35	849	0.90	0.31	842
Has soap on hand	0.97	0.17	798	0.98	0.13	808
<i>Aquatabs</i>						
Number of Aquatabs purchased	1.63	2.74	848	0.57	1.69	840

Table 2. Summary of balance checks (all p-values obtained using standard errors clustered by village)

Families used in multiple inference testing	Mean	Treatment effect	SE of diff	# of households	Lowest p-value	Lowest q-value
Ang Snoul	0.52	0.001	0.01	895	0.944	-
Religion	0.02	-0.01	0.01	891	0.233	-
Respondent age	43.0	-1.3	0.97	892	0.179	-
Respondent sex	0.72	0.01	0.03	891	0.781	-
Respondent marital status	0.80	-0.03	0.04	891	0.388	-
Feces in household	0.55	0.02	0.03	895	0.561	-
Number of tractors	0.06	-0.04	0.01	883	0.008***	-
Diarrhea: Diarrhea in past two weeks; Diarrhea incidence; Child diarrhea incidence					0.251	0.999
E coli: Source water, stored water, rain water, in-house water					0.291	0.999
Education: Average years of adult education, respondent literacy					0.218	0.773
Knowledge about diarrhea prevention: Believes in prevention; lists each of 17 causes of diarrhea <u>Significant p-values:</u> Says eating food touched by flies causes diarrhea (0.037); Says not washing hands causes diarrhea (0.020); Says raw food causes diarrhea (0.062); Says too much food causes diarrhea (0.088)					0.020	0.499
Knowledge about diarrhea symptoms: Identification of 12 symptoms					0.194	0.999
Perceptions: Perceptions of source water; Perceptions of in-house drinking water					0.201	0.451
Water treatment: Daily treatment, boils water, minutes spent boiling water, cost of boiling water, cost of filtering, total treatment cost					0.130	0.999
Water handling: Mixes treated and untreated water; drinks directly from storage containers					0.293	0.999
Water taste test preferences: Prefers Aquatabs taste, prefers bottled water; trusts water safety; concentration of treated sample; thinks in-house water looks bad; thinks in-house water smells bad <u>Significant p-values:</u> Concentration of treated sample (0.061)					0.061*	0.577
Stated willingness to pay: Willing to pay for 200 liters treated water; highest price for soap; highest price for treatment product					0.129	0.562
Household size: Household size; Number of adults in household; Number of children in household <u>Significant p-values:</u> Number of children in household (0.055)					0.055*	0.197
Water sources: Use a different water source in the dry season; Uses piped water in the rainy season; Uses rain water in the rainy season; Uses piped water in the either season; Uses rain water in the either season; Uses surface water in the either season; Uses bottled water in the either season					0.137	0.663
House characteristics: Number of rooms; Separate kitchen; Separate livestock area; Market value of the house; Market value of plot; Market value of house and plot <u>Significant p-values:</u> Separate kitchen (0.096)					0.096*	0.999
Expenditures (monthly): Food, fuel, electricity; health; education; transport; landline phone; cell phone; liquor; total					0.243	0.999
Income (monthly): Salary, agricultural product; rent; self-employment; remittances; other; total					0.142	0.999
Renting/buying/selling land in past two years: Owned or bought crop land; leased crop land; given crop land on lease; sold crop land; value of land owned or bought; value of leased crop land; value of land given on lease; value of crop land sold					0.224	0.999
Animals: Cows; horses; pigs; goats/sheep					0.208	0.999
Assets: Refrigerators, fans; televisions; bicycles; motorcycles; cars/trucks; cell phones; mosquito nets					0.112	0.963
Soap and washing: Washes containers with soap; Uses soap for hand washing; Can show their soap; Identifies each of 15 soap use occasions; # of use occasions identified <u>Significant p-values:</u> Uses soap after defecating (0.026); # of use occasions identified (0.029)					0.026**	0.380

For additional details on specific variable differences, see Appendix Table A4.

Table 3. Single-stage model (OLS clustered at the village level with enumerator fixed effects)

VARIABLES	Outcome: Number of Aquatabs purchased in Round 1		
	(1) Full Sample	(2) Contaminated Water Sample	(3) Clean Water Sample
Perceptions in Round 1	-0.09*** (0.02)	-0.07*** (0.02)	-0.20* (0.10)
Treatment status	0.12 (0.15)	0.14 (0.15)	0.40 (0.68)
Ang Snoul	-0.06 (0.20)	-0.05 (0.19)	-0.62 (0.70)
Respondent literacy	0.63*** (0.18)	0.67*** (0.18)	0.36 (0.73)
Respondent age	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.02)
Respondent sex (female = 1)	-0.23 (0.16)	-0.27* (0.15)	-0.36 (0.80)
Number of household children	-0.01 (0.07)	0.04 (0.07)	-0.31 (0.25)
Primarily uses piped water in the rainy season	0.58** (0.28)	0.73** (0.36)	0.33 (0.38)
Diarrhea in the past 2 weeks	0.27 (0.28)	0.19 (0.33)	0.64 (0.83)
Named dirty water as cause of diarrhea	-0.06 (0.27)	-0.13 (0.29)	0.16 (0.81)
Treats their water	-0.16 (0.17)	-0.09 (0.23)	-0.69 (0.62)
Above mean predicted total expenditures	0.40** (0.18)	0.37** (0.18)	0.36 (0.44)
Thinks their water tastes/smells good	-0.25 (0.28)	0.23 (0.20)	-2.65** (1.22)
Constant	2.05*** (0.57)	1.53*** (0.44)	6.23 (3.77)
Observations	800	698	101
R-squared	0.05	0.05	0.20

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4. Round 2 behaviors, single-stage (standard errors clustered at the village level)

	Uses piped water	Changed water source between rounds	Boils their water	Uses a chemical treatment product	Stored water shorter in Round 2	Cleaned storage units more in Round 2	Number of uses of soap	Uses open defecation
VARIABLES	(1) logit	(2) logit	(3) logit	(4) logit	(5) logit	(6) logit	(7) OLS	(8) logit
Bought Aquatabs in Round 1	-0.10 (0.20)	0.21 (0.20)	-0.43*** (0.12)	3.54*** (0.53)	0.13 (0.21)	0.10 (0.15)	0.06 (0.05)	0.08 (0.16)
Perceptions in Round 1	-0.21 (0.39)	-0.04 (0.04)	0.04 (0.13)	0.34 (0.24)	-0.01 (0.03)	0.01 (0.03)	-0.01 (0.01)	0.36*** (0.14)
Treatment status	0.04 (0.07)	-0.11 (0.14)	-0.08*** (0.02)	-0.05 (0.04)	0.35 (0.26)	-0.01 (0.16)	0.08 (0.06)	-0.02 (0.03)
Above bottom 25% predicted expenditures	-0.93** (0.46)	-0.39** (0.17)	0.20 (0.20)	0.14 (0.30)	0.17 (0.17)	0.17 (0.16)	-0.00 (0.08)	0.33* (0.19)
Constant	-13.12*** (0.94)	0.50 (1.21)	-2.24** (0.99)	-5.07*** (1.49)	-15.02 (0.96)	-2.38 (1.31)	1.58*** (0.20)	1.06 (1.41)
Observations	786	793	805	795	806	806	813	804

Controls that are included but not shown: Community, literacy, age, sex, diarrhea in past two weeks, named dirty water as a cause of diarrhea, number of children, likes the taste/smell of their own water, and enumerator fixed effects.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5. First stage predicting perceptions (standard errors clustered by village)

VARIABLES	(1) Full Sample	(2) Contaminated water sample	(3) Clean water sample
Information treatment	-0.88** (0.37)	-0.94*** (0.35)	-0.56 (1.02)
Respondent literacy	-0.99*** (0.20)	-0.90*** (0.20)	-1.61** (0.74)
Faeces	-0.46** (0.22)	-0.43* (0.23)	-0.70 (0.58)
Respondent literacy*info	0.80 (0.51)	0.61 (0.46)	2.42** (1.18)
Ang Snoul	-0.62*** (0.21)	-0.55** (0.24)	-1.98*** (0.44)
Constant	4.75*** (0.21)	4.68*** (0.21)	6.06*** (0.78)
Observations	839	731	107
R-squared	0.03	0.03	0.14

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Second stage model for purchase of Aquatabs (standard errors clustered at village level; enumerator fixed effects)

VARIABLES	Outcome: Strips of Aquatabs purchased (OLS)			Outcome: Households bought any Aquatabs (logit)		
	(1)	(2)	(3)	(1)	(2)	(3)
	Full Sample	Contaminated Water Sample	Clean Water Sample	Full Sample	Contaminated Water Sample	Clean Water Sample
Perceptions in Round 1 (predicted)	-0.23*	-0.25**	-0.09	-0.20	-0.24	-0.46
	(0.12)	(0.12)	(0.67)	(0.16)	(0.16)	(0.59)
Respondent age	-0.00	-0.00	-0.01	-0.01	-0.01	0.02
	(0.01)	(0.01)	(0.02)	(0.00)	(0.00)	(0.03)
Respondent sex	-0.31	-0.37**	-0.28	-0.27**	-0.37**	0.27
	(0.19)	(0.18)	(0.97)	(0.13)	(0.15)	(0.64)
Primarily uses piped water in the rainy season	0.30	0.25	0.62	-0.02	-0.17	1.03
	(0.34)	(0.45)	(0.76)	(0.26)	(0.27)	(0.96)
Diarrhea in the past 2 weeks	0.43	0.35	1.02	0.22	0.18	0.56
	(0.32)	(0.35)	(1.04)	(0.18)	(0.21)	(0.62)
Named dirty water as cause of diarrhea	-0.15	-0.22	0.33	-0.13	-0.16	0.56
	(0.25)	(0.28)	(0.80)	(0.15)	(0.18)	(0.97)
Treats their water	-0.44*	-0.43	-0.85	-0.26	-0.20	-1.32*
	(0.26)	(0.32)	(0.67)	(0.24)	(0.23)	(0.75)
Number of children	0.01	0.05	-0.34	0.12**	0.16***	-0.04
	(0.07)	(0.08)	(0.23)	(0.06)	(0.06)	(0.25)
Above mean predicted total expenditures	-0.27*	-0.29*	0.25	0.16	0.15	-0.18
	(0.16)	(0.17)	(0.56)	(0.16)	(0.15)	(0.65)
Likes the taste/smell of their own water	-0.29	0.09	-1.55	-0.31	-0.16	-1.18
	(0.34)	(0.22)	(1.37)	(0.36)	(0.37)	(0.90)
Constant	3.16***	3.74***	3.25			
	(0.98)	(0.60)	(3.79)	799	697	97
Observations	800	698	101	801	697	102
R-squared	0.11	0.10	0.41	0.11	0.10	0.39

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7. Two-stage estimate of the effect of perceptions on purchase of Aquatabs and other outcomes (standard errors clustered at village level; enumerator fixed effects)

	Complete first stage from Table 5	Simple first stage – information IV only
Number of Aquatabs	-0.23* (0.12)	-0.22 (0.52)
Bought any Aquatabs	-0.20 (0.16)	-0.74* (0.38)
Boil water	-0.23 (0.19)	-0.09 (0.34)
Use chemical treatment	-0.22 (0.22)	-1.50** (0.60)

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8. Second stage model for round 2 behaviors (standard errors clustered at the village level; enumerator fixed effects)

VARIABLES	Uses piped water (1) logit	Changed water source between rounds (2) logit	Boils their water (3) logit	Uses a chemical treatment product (4) logit	Stored water shorter in Round 2 (5) logit	Cleaned storage units more Round 2 (6) logit	Number of uses of soap (7) OLS	Uses open defecation (8) logit
Bought Aquatabs in Round 1 (predicted)	0.09 (1.24)	0.60 (0.63)	0.48 (0.49)	2.01*** (0.62)	-0.24 (0.58)	1.55*** (0.49)	0.19 (0.18)	-0.24 (0.45)
Perceptions in Round 1 (predicted)	-0.81** (0.41)	-1.01*** (0.17)	-0.23 (0.19)	-0.22 (0.22)	-0.10 (0.15)	-0.30** (0.12)	-0.20*** (0.06)	1.15*** (0.18)
Respondent age	-0.02** (0.01)	-0.00 (0.01)	0.02*** (0.01)	0.01 (0.01)	0.00 (0.00)	0.00 (0.01)	-0.00*** (0.00)	-0.01 (0.01)
Respondent sex	-0.37 (0.34)	-0.22 (0.16)	-0.44 (0.28)	0.40 (0.26)	-0.13 (0.15)	0.39* (0.22)	0.14* (0.08)	0.27 (0.19)
Diarrhea in the past 2 weeks	-1.95* (1.01)	-0.31 (0.21)	-0.22 (0.28)	0.62* (0.32)	0.10 (0.22)	-0.04 (0.23)	0.01 (0.06)	0.06 (0.17)
Named dirty water as cause of diarrhea	0.24 (0.36)	0.06 (0.20)	0.22 (0.19)	0.47 (0.35)	-0.08 (0.13)	-0.07 (0.18)	0.00 (0.06)	-0.23 (0.16)
Number of children	0.07 (0.11)	0.08 (0.06)	-0.07 (0.09)	0.07 (0.09)	0.07 (0.05)	0.09 (0.06)	-0.01 (0.02)	0.14** (0.06)
Above bottom 25% predicted total expenditures	-1.03** (0.47)	-0.40** (0.18)	0.17 (0.19)	0.13 (0.30)	-0.06 (0.15)	0.13 (0.15)	-0.02 (0.09)	0.44** (0.19)
Likes the taste/smell of their water	-0.01 (0.49)	-0.10 (0.40)	1.50*** (0.40)	0.25 (0.52)	0.28 (0.43)	-0.19 (0.48)	0.22** (0.10)	-1.12*** (0.33)
Constant	-10.37*** (1.29)	2.64** (1.23)	-2.38 (1.47)	-1.65 (1.30)	0.36 (1.86)	0.02 (1.25)	2.30*** (0.36)	-3.38*** (1.28)
Observations	786	786	805	795	806	806	806	804

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendices – Sales script, attrition analysis and additional tables

Sales script

NO.	Description of the activities that need to be observed
	Pour two glasses of water to drink together
☺	Thank you so much for answering our questions. Now it's time for your luck!
☺	Let's drink a glass of water together (Smile to make them feel less worried)
☺	This water is delicious! Do you find it to be delicious? (They do not need to respond) Isn't it lucky to drink water together at your house today?

5.3. **[Enumerator, record whether they agree to share a sample of water with you.]**

[0] No [1] Yes

[Enumerator: say things like “This water is delicious! Don’t you find it delicious?”]

[Enumerator: show them the leaflet from WaterShed (Figure 1 below) and give them a chance to look it over.]

5.4. Do you know other sorts of problems that can be caused by drinking dirty water every day?

[0] No [1] Yes [-9] Don't know

[Enumerators: give them a chance to give some ideas, can talk a bit about them if they want.]

[Enumerators: show them the slides with the circle with pictures of diseases caused by dirty water.]

5.5. Have you ever seen before anything in this picture?

[0] No [1] Yes [-9] Don't know

[For each of these, thank them after their answer.]

5.6. Do you think it's possible that you and your family might get diarrhea from contaminated water?

[0] No [1] Yes [-9] Don't know

5.7. Do you think it's possible that you and your family might get diarrhea with blood because of contaminated water?

[0] No [1] Yes [-9] Don't know

5.8. Do you think it's possible that you and your family might be die because of water?

[0] No [1] Yes [-9] Don't know

I told you that today I will bring luck to your house, do you remember?

If there is a way to prevent problems such as diarrhea diarrhea with blood or even lead to death, would you want it? (Convince them they want it.)

Great! Now I will tell you more clearly.

This is a product to treat water effectively

1. ***[Enumerators: show them the slide demonstrating how Aquatab works (Figure 3 below); explain that one Aquatab is designed to treat 20L of drinking water, not more, not less. Also explain that the tablet***

takes at least 20 minutes to kill the disease agents so water should not be consumed immediately after adding it]

- 2. Do you see, it is very good and easy to use isn't it? It must be good.
- 3. I forgot to tell you; (laugh) the water we drank together was treated by this product. Do you see it is very effective, I even drank it myself!

Now your luck has come! How many strips do you want?

5.9. **[Enumerators, answer any further questions they have. Then record how many strips they choose to buy and make the sale.]**

_____ strips x 500 riel = _____ riel total

We will return in about six weeks to see how the product is working for you. At that time, only if you have kept the packaging (for both used and unused tablets), we will give you a gift.

[Enumerator: IF they bought some Aquatab, MAKE SURE to remind them to keep the packaging until we return in roughly six weeks and give them the reminder sheet with instructions]

Great! Thank you so much. Now we just have a few final questions.

Figure 1: Leaflet from WaterShed Cambodia



**ទឹកពិសាររបស់អ្នកអាចកខ្វក់
ជាងការគិតរបស់អ្នកទៅទៀត**
សម្លាប់មេរោគក្នុងទឹកហើយ ឬនៅមុននឹងពិសា ?



វិធី ៣យ៉ាង ដើម្បីសម្លាប់មេរោគទាំងនោះ (រាប់ទាំងទឹកភ្លៀង)

- 1. ដាំទឹកឲ្យពុះ
- 2. ដាក់ថ្នាំទៅក្នុងទឹក
- 3. ប្រើឧបករណ៍ចម្រោះ

Attrition analysis

Between Baseline and the end of Round 2, 69 households left the sample. Since we had 921 households in Baseline, this gives us an overall attrition rate of 7.5%. Of those who attrited, 38 households moved, two did not have appropriate respondents available (there were no adults currently living there or the remaining adults had mental health problems), and two refused to participate. We were unable to locate the remaining 27 due to problems with the maps, addresses, and GPS coordinates.

We compared the households that attrited and those that did not for approximately 115 characteristics collected during Baseline, and then performed the same comparisons for the two largest subgroups of attritors (those households that moved and those households that could not be located). Due to potential clustering at the village level, we compared means using regressions with attrition as the independent variable and the covariate we are interested in as the dependent variable, rather than using simple t-tests.

Some of the key results for the three versions of the attrition analysis (all attritors versus non-attritors, movers versus non-attritors, and households that could not be located versus non-attritors) can be found in tables A1-A3 below. We find that, overall, households that attrited had younger respondents and smaller households (due to having fewer children), and were poorer by almost every socioeconomic indicator. They had, for example, lower expenditures in most categories and fewer assets. Perhaps related to this, they are also more likely to have had diarrhea lasting longer than 14 days. Interestingly, they are slightly more likely to believe diarrhea can be prevented while being slightly less likely to use soap for hand washing or to treat their water daily. Finally, they are more likely to be from the community of Svey Ampear and slightly more likely to have been assigned to the information treatment group. All of these differences have to be kept in mind when performing robustness checks and thinking about possible sources and directions of bias in our results.

Table A1. All attritors compared to non-attritors

Variable	Mean for attritors	Mean for non-attritors	Coefficient on attrition	P-value	Number that attrited	Number of non-attritors
Age of respondent	37.38	42.65	-6.21	0.003***	69	843
Household size	4.25	5.39	-1.29	0.000***	69	844
Did respondent have diarrhea lasting longer than 14 days?	0.50	0.05	0.95	0.000***	2	41
Believes diarrhea can be prevented	0.97	0.74	.041	0.000***	69	840
Does something to treat their water	0.77	0.83	-0.08	0.101	69	844
Total cost for water treatment	5,180.19	6,456.85	-2227.04	0.019**	69	846
Uses soap for hand washing	0.71	0.83	-0.06	0.145	69	843
Treats water daily	0.55	0.62	-0.07	0.263	69	846
Number of rooms	0.82	1.22	-0.43	0.009***	68	837
Separate kitchen	0.38	0.64	-0.26	0.002***	68	840
Total expenditures	385,943.50	724,785.70	-363,797.30	0.000***	69	845
Total earnings	2,484,831	6,717,503	-4,439,601	0.160	51	649
Market value of their house	1.63e+07	2.00e+07	-1.15e+07	0.000***	61	807
Bought/owned cropland in past 2 years	0.37	0.61	0.25	0.000***	68	834
Number of cows	0.62	1.33	-0.73	0.000***	68	840
Number of televisions	0.62	0.95	-0.35	0.000***	68	835

Number of mosquito nets	2.40	3.28	-1.09	0.000***	68	835
Primary source of water in the rainy season is piped water	0.01	0.05	-0.05	0.001***	69	846
Has a piped connection	0.16	0.25	-0.09	0.123	69	846
Overall diarrhea incidence	0.07	0.05	0.03	0.250	69	844
Incidence of child diarrhea	0.16	0.08	0.12	0.078*	31	339
Thinks their water smells bad	0.014	0.012	-0.12	0.005***	69	847
Thinks their water looks bad	0.10	0.12	-0.03	0.608	69	847
E-coli in storage containers	196.57	56.42	183.82	0.230	5	117
From Ang Snoul	0.35	0.53	-0.20	0.000***	69	846
Treatment	0.41	0.51	-0.15	0.001***	69	851

Table A2. Those who moved compared to non-atritors

Variable	Mean for those who moved	Mean for non-atritors	Coefficient on attrition	P-value	Number that moved	Number of non-atritors
Age of respondent	36.16	42.65	-7.01	0.001***	38	843
Household size	4.13	5.39	-1.27	0.001***	38	844
Believes diarrhea can be prevented	0.97	0.96	0.04	0.000***	38	822
Does something to treat water	0.74	0.83	-0.10	0.141	38	844
Total cost for water treatment	4,978.51	6,456.85	-1,371.72	0.320	38	846
Uses soap for hand washing	0.71	0.83	-0.10	0.069*	38	843
Treats their water daily	0.50	0.62	-0.13	0.034**	38	846
Number of rooms	0.79	1.22	-0.45	0.018**	38	837
Separate kitchen	0.34	0.64	-0.29	0.000***	38	840
Total expenditures	380,910.50	724,785.70	-351,738.10	0.000***	38	845
Total earnings	1,991,364	6,717,503	-5,004,792	0.092*	28	649
Market value of their house	9,252,357	2.45e+07	-1.37e+07	0.000***	28	659
Bought/owned cropland in past 2 years	0.29	0.61	-0.34	0.000***	38	834
Number of cows	0.47	1.33	-0.82	0.000***	38	840
Number of televisions	0.58	0.95	-0.38	0.001***	38	835
Number of mosquito nets	2.10	3.28	-1.17	0.000***	38	835
Primary source in rainy season is piped water	0.61	0.83	-0.05	0.001***	38	846
Has a piped connection	0.11	0.25	-0.15	0.010**	38	846
Diarrhea incidence	0.09	0.05	0.05	0.281	38	844
Incidence of child diarrhea	0.09	0.05	0.10	0.342		
Thinks their water smells bad	0	0.01	-0.01	0.005***	38	847
Thinks their water looks bad	0.08	0.12	-0.06	0.095*	38	847
E-coli in storage containers	0.42	56.42	-57.64	0.005***	2	117
From Ang Snoul	0.39	0.53	-0.12	0.076*	38	846
Treatment	0.34	0.51	-0.18	0.006***	38	851

Table A3. Those households that could not be found compared to non-attritors

Variable	Mean for those who could not be found	Mean for non-attritors	Coefficient on attrition	P-value	Number that could not be found	Number of non-attritors
Age of respondent	38.30	42.65	-5.90	0.220	27	843
Household size	4.59	5.39	-0.05	0.000***	27	844
Believes diarrhea can be prevented	0.96	0.96	0.04	0.000***	27	822
Does something to treat water	0.81	0.83	-0.03	0.793	27	844
Total cost for water treatment	5,675.93	6,456.85	-4,201.44	0.004***	27	846
Uses soap for hand washing	0.67	0.83	-0.03	0.783	27	843
Treats their water daily	0.63	0.62	0.11	0.324	27	846
Number of rooms	0.85	1.22	-0.45	0.168	26	837
Separate kitchen	0.46	0.64	-0.14	0.431	26	840
Total expenditures	408,111.10	724,785.7	-370,013.10	0.007***	27	845
Total earnings	1,421,075	6,717,503	-6,027,239	0.024**	20	649
Market value of their house	3.02e+07	2.45e+07	-1.07e+07	0.001***	21	659
Bought/owned cropland in past 2 years	0.42	0.61	-0.11	0.313	26	834
Number of cows	0.69	1.33	-0.74	0.000***	26	840
Number of televisions	0.65	0.95	-0.31	0.002***	26	835
Number of mosquito nets	2.77	3.28	-1.06	0.002***	26	835
Primary source in rainy season is piped water	0.93	0.83	0.10	0.182	27	846
Has a piped connection	0.26	0.25	0.08	0.510	27	846
Diarrhea incidence	0.05	0.05	0.01	0.758	27	844
Incidence of child diarrhea	0.15	0.08	0.18	0.050*	13	339
Thinks their water smells bad	0.04	0.01	-0.01	0.005***	27	847
Thinks their water looks bad	0.11	0.12	0.01	0.899	27	847
E-coli in storage containers	327.33	56.42	425.28	0.240	3	117
From Ang Snoul	0.30	0.53	-0.39	0.002***	27	846
Treatment	0.48	0.51	-0.11	0.458	27	851

Balance checks

Table A4. Full balance checks – all p-values obtained using standard errors clustered by village

	Mean	Treatment effect	SE of diff	# of households	p-value	q-value
Ang Snoul	0.52	0.001	0.01	895	0.944	-
Religion	0.02	-0.01	0.01	891	0.233	-
Respondent age	42.98	-1.33	0.97	892	0.179	-
Respondent sex	0.72	0.01	0.03	891	0.781	-
Respondent marital status	0.80	-0.03	0.04	891	0.388	-
Faeces in household	0.55	0.02	0.03	895	0.561	-
Number of tractors	0.06	-0.04	0.01	883	0.008***	-
Diarrhea						
Diarrhea in past two weeks	0.15	0.02	0.01	886	0.251	0.999
Diarrhea incidence	0.05	0.003	0.004	893	0.534	0.999
Child diarrhea incidence	0.07	0.02	0.02	363	0.371	0.999
E coli						
Ecoli in source water	13.92	41.76	33.06	138	0.219	0.999
Ecoli in stored water	61.26	3.13	35.40	120	0.931	0.999
Ecoli in rain water	903.37	-821.13	868.09	87	0.355	0.999
Ecoli in in-house water	26.60	6.85	31.96	75	0.833	0.999
Education						
Average years of adult education	5.79	-0.10	0.16	893	0.561	0.773
Respondent literacy	0.72	-0.04	0.03	889	0.218	0.773
Knowledge about diarrhea prevention						
Believes diarrhea can be prevented	0.96	-0.004	0.01	871	0.651	0.499
Lists dirty water as a cause of diarrhea	0.78	-0.01	0.02	895	0.758	0.499
Says eating stale food causes diarrhea	0.13	0.04	0.02	899	0.113	0.499
Says eating food from vendors causes diarrhea	0.02	0.02	0.01	899	0.119	0.499
Says eating food touched by flies causes diarrhea	0.07	0.05	0.02	899	0.037**	0.499
Says eating unclean food causes diarrhea	0.70	-0.01	0.03	899	0.634	0.499
Says drinking dirty water causes diarrhea	0.78	-0.003	0.02	899	0.882	0.499
Says open defecation causes diarrhea	0.01	0.002	0.01	899	0.759	0.499
Says not washing hands causes diarrhea	0.02	0.03	0.01	899	0.020**	0.499
Says bad weather causes diarrhea	0.02	0.01	0.01	899	0.585	0.499
Says sun exposure causes diarrhea	0.004	-0.002	0.004	899	0.575	0.499
Says teething causes diarrhea	1.52e-17	0.002	0.002	899	0.260	0.647
Says vaccines cause diarrhea	0.002	-0.002	0.002	899	0.262	0.647
Says household dirtiness causes diarrhea	0.27	-0.02	0.03	899	0.439	0.499
Says village dirtiness causes diarrhea	0.01	0.01	0.01	899	0.307	0.693
Says food with chemicals cause diarrhea	0.07	0.01	0.02	899	0.674	0.499
Says raw food causes diarrhea	0.05	0.03	0.02	899	0.062*	0.499
Says too much food causes diarrhea	0.02	-0.01	0.01	899	0.088*	0.499

Knowledge about diarrhea symptoms						
Says loose stool is a symptom	0.51	0.001	0.03	899	0.975	0.999
Says blood in stool is a symptom	0.08	-0.01	0.01	899	0.415	0.999
Says abdominal pain is a symptom	0.75	-0.03	0.03	899	0.226	0.999
Says soft skull is a symptom	0.004	0.01	0.01	899	0.298	0.999
Says fever is a symptom	0.18	0.03	0.03	899	0.416	0.999
Says vomiting is a symptom	0.11	0.14	0.03	899	0.194	0.999
Says weakness is a symptom	0.30	0.02	0.02	899	0.478	0.999
Says dehydration is a symptom	0.09	0.001	0.02	899	0.966	0.999
Says loss of self is a symptom	0.01	0.01	0.01	899	0.299	0.999
Says headache is a symptom	0.02	0.004	0.01	899	0.674	0.999
Says constipation is a symptom	0.02	0.01	0.01	899	0.319	0.999
Says frequent stools are a symptom	0.01	0.01	0.01	899	0.377	0.999
Perceptions						
Perceptions of source water	3.82	-0.17	0.17	892	0.311	0.451
Perceptions of in-house water	9.16	-0.14	0.11	891	0.201	0.451
Water treatment						
Treats their water daily	0.83	-0.02	0.02	893	0.289	0.999
Boils their water	0.84	0.01	0.02	738	0.455	0.999
Minutes spent boiling their water	19.25	-0.23	0.68	687	0.736	0.999
Cost of boiling their water	7845.28	42.91	852.22	623	0.960	0.999
Cost of filtering their water	93818.75	73296.88	46659.55	64	0.130	0.999
Total water treatment cost	6325.02	23.30	659.06	895	0.972	0.999
Water handling						
Mixes treated and untreated water	0.07	0.01	0.02	734	0.523	0.999
Drinks from storage containers	0.55	0.02	0.02	893	0.293	0.999
Water taste test preferences						
Preferred the Aquatab sample	0.27	0.02	0.03	883	0.527	0.577
Preferred the bottled sample	0.65	-0.01	0.03	641	0.815	0.577
Trusted the water sample was safe	0.93	0.01	0.02	411	0.678	0.577
Concentration of water sample	2.07	-0.21	0.11	870	0.061*	0.577
Thinks their water looks bad	0.13	-0.02	0.02	895	0.161	0.673
Thinks their water smells bad	0.01	0.002	0.01	895	0.687	0.577
Willingness to pay						
Willing to pay for 200 liters	1.27	0.02	0.04	855	0.539	0.562
Highest price would pay for soap	1041.78	-117.58	75.51	432	0.129	0.562
Highest price would pay for similar product	2530.23	-199.18	267.84	434	0.462	0.562
Household size						
Household size	5.24	0.14	0.19	893	0.451	0.770
Number of adults in household	4.79	0.08	0.18	893	0.653	0.770
Number of children in household	0.46	0.06	0.03	895	0.055*	0.197
Water sources						
Use a different water source in the dry season	0.77	0.02	0.02	847	0.389	0.663
Uses piped water in the rainy season	0.04	0.02	0.01	895	0.137	0.663
Uses rain water in the rainy season	0.84	-0.03	0.03	895	0.227	0.663
Uses piped water in either season	0.20	0.01	0.03	895	0.669	0.663
Uses well water in either season	0.06	0.01	0.01	895	0.701	0.663
Uses surface water in either season	0.19	0.04	0.03	899	0.137	0.663
Uses bottled water in either season	0.31	-0.04	0.03	899	0.228	0.663
House						
Number of rooms	1.24	-0.08	0.07	885	0.277	0.999
Separate kitchen	0.65	-0.05	0.03	888	0.096*	0.999

Separate livestock area	0.47	-0.02	0.03	884	0.497	0.999
Market value of the house	2.52e+07	-2831169	2925215	695	0.339	0.999
Market value of their plot	4.63e+07	481001.4	6092547	623	0.938	0.999
Market value of house and plot	7.65e+07	1417785	1.06e+07	586	0.895	0.999
Expenditures (monthly)						
Food	340473.8	471.39	21351.92	886	0.982	0.999
Fuel	16207.91	-1335.28	2389.80	872	0.579	0.999
Electricity	28263.24	-2204.24	1869.78	877	0.245	0.999
Health	46457.29	2785.76	16604.80	768	0.868	0.999
Education	267352.10	-185780.20	17339.40	881	0.290	0.999
Transportation	74659.84	-5440.83	8868.50	765	0.543	0.999
Landline	3476.91	-67.19	900.46	873	0.941	0.999
Cell phone	26970.45	-3484.75	3871.85	814	0.373	0.999
Liquor	32294.98	-11918.03	11583.56	843	0.310	0.999
Total expenditures	807977.40	-204919.30	172836.6	894	0.243	0.999
Income (monthly)						
Salary	1792374	-1370698	1247632	853	0.279	0.999
Agricultural products	3242150	1128281	3796254	859	0.768	0.999
Rent	50511.13	-30896.72	24367.25	882	0.212	0.999
Self-employment	662922.10	785362.80	524827.4	869	0.142	0.999
Remittances	82872.15	15696.23	47703.36	879	0.744	0.999
Other earnings	40056.60	101281.10	129231.8	750	0.438	0.999
Total earnings	5292390	2417522	5255468	687	0.648	0.999
Renting/buying/selling land in past two years						
Owned or bought crop land	0.62	-0.05	0.05	882	0.261	0.999
Leased crop land	0.17	-0.02	0.02	884	0.425	0.999
Given crop land on lease	0.09	-0.01	0.02	885	0.610	0.999
Sold crop land	0.03	-0.01	0.01	882	0.686	0.999
Value of land owned or bought	6.51e+07	-9332421	2.55e+07	328	0.717	0.999
Value of leased crop land	4.33e+07	1231550	1.42e+07	52	0.932	0.999
Value of land given on lease	3.15e+07	1.26e+07	1.41e+07	48	0.390	0.999
Value of crop land sold	1.25e+07	6.60e+07	5.15e+07	27	0.224	0.999
Animals						
Number of cows	1.29	-0.03	0.12	888	0.824	0.999
Number of horses	0.002	0.004	0.005	888	0.426	0.999
Number of pigs	0.69	-0.15	0.16	888	0.380	0.999
Number of goats/sheep	0.14	0.10	0.08	888	0.208	0.999
Assets						
Refrigerators	0.01	0.002	0.01	881	0.848	0.963
Fans	0.69	0.03	0.07	883	0.661	0.963
Televisions	0.93	-0.002	0.04	883	0.967	0.963
Bicycles	1.09	-0.07	0.05	883	0.146	0.963
Motorcycles	0.94	-0.09	0.06	883	0.112	0.963
Cars/trucks	0.08	0.03	0.02	883	0.184	0.963
Cell phones	1.69	-0.09	0.10	883	0.340	0.963
Mosquito nets	3.20	0.03	0.09	883	0.725	0.963
Soap and washing						
Washes containers with soap	0.31	0.03	0.02	883	0.156	0.380
Uses soap for hand washing	0.83	0.01	0.02	892	0.612	0.380
Can show their soap	0.98	-0.01	0.01	742	0.266	0.380
Has soap on hand	0.81	-0.01	0.02	895	0.818	0.380
Uses soap to wash clothes	0.07	0.02	0.01	895	0.193	0.380
Uses soap to wash children	0.01	-0.002	0.01	895	0.636	0.380

Uses soap when bathing	0.17	0.02	0.02	895	0.292	0.380
Uses soap after washing babies	0.01	0.01	0.01	895	0.108	0.380
Uses soap after defecating	0.19	0.05	0.02	895	0.026**	0.380
Uses soap before preparing food	0.16	-0.01	0.02	895	0.690	0.380
Uses soap before eating	0.70	-0.01	0.03	895	0.596	0.380
Uses before handling water	0.02	-0.003	0.01	895	0.803	0.380
Uses soap when dirty	0.45	0.03	0.03	895	0.379	0.380
Uses soap after eating	0.03	0.01	0.01	895	0.377	0.380
Uses soap when washing dishes	0.04	0.02	0.01	895	0.154	0.380
Uses soap before going to sleep	0.11	-0.004	0.02	895	0.852	0.380
Uses soap when comes home	0.01	-0.002	0.01	895	0.644	0.380
Uses soap with livestock	0.005	-0.002	0.005	895	0.637	0.380
Uses soap when breastfeeding	0.002	0.002	0.04	895	0.585	0.380
Sum of all uses of soap	1.98	0.12	0.05	895	0.029**	0.380

Model for predicted expenditures

Table A5. Total Expenditures (OLS clustered at the village level)

VARIABLES	(1)
Bought/owned cropland in last two years	-82,072 (125,622)
Taken cropland on lease in last two years	629,588 (538,607)
Given cropland on lease in last two years	-79,592 (91,863)
Sold cropland in last two years	-382,151 (301,045)
Cows	46,103 (36,446)
Horses	-200,058*** (55,970)
Pigs	7,537 (9,801)
Goat/sheep	220 (9,757)
Refrigerators	196,905 (260,522)
Electric fans	-130,807 (130,304)
Televisions	373,896 (357,750)
Bicycles	26,518 (39,541)
Motorcycles	54,985 (62,342)
Cars/trucks	130,939 (239,583)
Tractors	-340,447** (126,291)
Cell phones	184,179** (89,427)
Mosquito nets	509* (277)
Number of rooms	-29,454 (46,089)
Separate kitchen	-291,796 (283,279)
Separate area for livestock	-349,230 (223,238)
Constant	376,404*** (69,868)
Observations	662
R-squared	0.06

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Model predicting purchase of Aquatabs

Table A6. First stage model for purchase of any Aquatabs in Round 1 (standard errors clustered by village)

VARIABLES	(1)
Interviewer 2	0.53 (1.48)
Interviewer 3	-0.00 (1.58)
Interviewer 4	-0.03 (1.52)
Interviewer 5	0.69 (1.68)
Interviewer 6	0.69 (1.89)
Interviewer 7	0.29 (1.61)
Interviewer 8	-0.22 (1.48)
Interviewer 9	0.03 (1.42)
Interviewer 10	0.72 (1.40)
Interviewer 11	-0.82 (1.43)
Interviewer 12	1.10 (1.44)
Interviewer 13	-0.41 (1.39)
Interviewer 14	-0.20 (1.38)
Interviewer 15	-0.38 (1.44)
Interviewer 16	1.47 (1.43)
Interviewer 17	0.69 (1.89)
Interviewer 18	1.79 (1.67)
Constant	0.00 (1.43)
Observations	847
Pseudo R-squared	0.06

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Multiple inference analysis for 2-stage model outcomes

Table A7. Perceptions in Round 1 (predicted)

	p-value	q-value
Primarily use piped water in Round 2	0.048**	0.05*
Currently boil their water in Round 2	0.247	0.155
Changed water sources between rounds	0.000***	0.001***
Covered their water storage containers	0.407	0.205
Takes water out of the container safely	0.234	0.155
Used a water treatment product in Round 2	0.109	0.097*
Used a chemical water treatment product in Round 2	0.301	0.177
How long they stored treated water in Round 2	0.002***	0.004***
Stored treat water for less time in Round 2	0.118	0.097*
How often cleaned water storage containers in Round 2	0.000***	0.001***
Cleaned storage containers more often in Round 2	0.015**	0.02**
Number of uses for soap	0.002***	0.004***
Practiced open defecation in Round 2	0.000***	0.001***

Table A8. Bought any Aquatabs in Round 1 (predicted)

	p-value	q-value
Primarily use piped water in Round 2	0.945	0.006***
Currently boil their water in Round 2	0.332	0.607
Changed water sources between rounds	0.336	0.607
Covered their water storage containers	0.935	0.006***
Takes water out of the container safely	0.962	0.006***
Used a water treatment product in Round 2	0.002***	0.007***
Used a chemical water treatment product in Round 2	0.001***	0.006***
How long they stored treated water in Round 2	0.003***	0.008***
Stored treat water for less time in Round 2	0.745	0.006***
How often cleaned water storage containers in Round 2	0.146	0.356
Cleaned storage containers more often in Round 2	0.001***	0.006***
Number of uses for soap	0.292	0.607
Practiced open defecation in Round 2	0.598	0.006***