Safe Drinking Water for Low-Income Regions:

Preferences and Affordability among End-Users

Case studies from Urban India and Rural Tanzania

by

Zachary Ian Burt

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Committee in charge:

Professor Isha Ray, Chair
Professor Kara L. Nelson
Professor Joan L. Walker
Professor Thomas F. Clasen

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Abstract

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"Nothing is more useful than water; but it will purchase scarce anything;
scarce anything can be had in exchange for it."
– Adam Smith, Wealth of Nations (1776: 1.4.13)

Well into the 21st century, safe and affordable drinking water remains an unmet human need. Globally, at least 1.8 billion people are potentially exposed to microbial contamination in their drinking water on a regular basis (Onda, LoBuglio, and Bartram 2012). These people are found disproportionately in low-income households located in developing countries; nearly half of all people without access to an improved water source live in Sub-Saharan Africa, while one fifth

live in Southern Asia (WHO/UNICEF 2015). Attempts at increasing access to safe water include a wide range of scales, from urban piped water networks providing services to millions of people, to Household Water Treatment and safe storage Systems (HWTS) which allow individuals to provide safe drinking water to their family.

Encouraging uptake across a population and ensuring consistent and correct usage are vital for the creation of improved health outcomes from HWTS interventions. For urban water utilities and community systems, assessing and addressing health risks, planning successful upgrades and forecasting revenue streams requires an understanding of how people access, collect and store water, as well as their willingness to pay (WTP) for water services. In the cases of both HWTS interventions and piped water systems, addressing this public health issue requires an understanding of the perspectives, preferences, access points and financial means of end-users, especially those at the lowest income levels and in the most inaccessible locales.

This dissertation has focused on two different case studies: one in rural Tanzania and the other in urban India. In both locations our teams collected observations regarding preferences and current practices of water access and usage. We measured WTP across a variety of potential options for drinking water treatment and access in both locations. In the city of Hubli-Dharwad, India, I evaluated a pilot project, measuring stated WTP for both end-users experiencing continuous water service (CWS) and those experiencing intermittent water service (IWS). In four rural villages of Tanzania we asked local residents to evaluate six HWTS, and then collected information on user preferences and WTP.

For both locations I analyzed our observations with current policy debates in mind, and gave recommendations for both future research as well as the local management of domestic water systems. These two very different locations have little in common except for a need to improve access to safe drinking water; my research provides vital information on how to create interventions that people want and need. The results from Tanzania are relevant for other countries in Sub-Saharan Africa, as well as other developing regions with limited access to improved water sources and high rates of turbidity. The results from Hubli-Dharwad are relevant to other urban areas in South Asia, and IWS piped water networks in other developing regions as well.

The knowledge generated in both locations also contributes to the literature on user preferences and WTP for water services. For the HWTS literature, my research addresses questions about why some HWTS interventions may have failed to scale up to a larger population or to sustain usage among participating households over time; namely that taste, smell, aesthetics, familiarity and ease of use are all vital components of an individual's decision as whether or not they will treat their drinking water. For this reason, boiling deserves reconsideration as a potentially important option for future HWTS interventions. WTP for retail HWTS is non-zero for the majority of households even in a highly impoverished location such as rural Tanzania, but it is still far below retail prices.

The user preferences and WTP analysis for in Hubli-Dharwad sheds light on what piped water services are valued by end-users, and gives some indications on whether and when they should be pursued, adding to the research literature concerning urban utility management and informal urban services. In particular, three key findings emerge from my work there. The first is that CWS may not always be the best upgrade option, and may not provide all of the benefits that it usually is assumed to provide, depending on the experiences, preferences and beliefs of the local end-users. Second, a subset of low-income households depends on free supplemental water sources and therefore service upgrade projects should not include their removal. And finally, water quality is important, but taste and smell can confound households' perceptions of water quality, and therefore water aesthetics are a salient issue that may deserve greater attention in the future.

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Glossary:

CWS	Continuous Water Service
HWTS	Household Water Treatment and Safe Storage System
IWS	Intermittent Water Service
S2S	Source to Sip
WTP	Willingness to Pay

Acknowledgements

I take responsibility for any mistakes, gaps in analysis or lack of imagination during interpretation of our observations; but I cannot take full credit for the work that was required in order to create this dissertation. For efforts made in the field collecting data, as well as later on in the analysis, interpretation and reporting of what was found, many other individuals made vital contributions.

In India I worked with fellow UC Berkeley PhD students (since graduated) Dr. Ayse Ercumen and Dr. Emily Kumpel, and their advisors Dr. Jonathan Colford and Dr. Kara Nelson, as well as my own advisor, Dr. Isha Ray. Our local collaborators were Dr. Nayanatara Nayak, Dr. Narayan Bilava both from the Center for Multi-Disciplinary Research. Together we oversaw a field team which included Madhu Reddy, Suma Hegde, Tejal A. Gokares, Sneha G.N., Anasuya A. Malagi, Shoba N. Madiwalar, Parvati M. Lulsangi, Drakshayani S. Chippalakattirath, Neelama C. Boodannavar, Vijayalaxmi M. Benallatti, Sunanda C. Boodannavar. Data analysis, interpretation and reporting of the results for the willingness to pay study conducted in Hubli-Dharwad was greatly assisted by the efforts of Dr. Akshay Vij and Molly Gordon.

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know about this field and provided me with a model of the type of academic researcher that I hope to become. Thank you, Isha.

1. *Introduction*

In low-income regions throughout the world, consumers continue to rely on unsafe drinking water sources. Microbial contamination is by far the greatest drinking water hazard in low-income areas (World Health Organization 2011); at least 1.8 billion people lack reliable access to water which is considered microbiologically safe (Onda, LoBuglio, and Bartram 2012). Almost 1000 child deaths per day result from diarrheal diseases caused by the microbial contamination of water, inadequate sanitation and hygiene (WHO 2015); the majority of these deaths could have been avoided using any number of safe drinking water systems.

There is a basic moral imperative to improve access to clean and safe drinking water in populations which suffer from easily preventable water borne illnesses. Yet the justifications for this type of development initiative vary; everything from economics to human rights. For example: a detailed meta-analysis comparing the economic benefits of universal access to safe water services (with chlorine) to the cost of such access finds a high benefit-cost ratio of between 5.7 and 6.3 for Africa, and between 6.5 and 9.9 for South and South-East Asia (Hutton, Haller, and Bartram 2007). At the same time, in 2010, “safe and clean” drinking water was officially recognized as essential for a life of health and dignity, and ordained as a human right by the community of nations (UN Human Rights Council 2010). Bringing reliable access to safe and clean drinking water makes economic sense. It is also now considered, a human right. These two different development frameworks reach the same conclusion, through different approaches. I now briefly introduce a third framework.

1.1 Three Development Frameworks: Freedom, Economics and Human Rights

In 2001 Amartya Sen argued that we should view the "…expansion of freedom … as both (1) the primary end and (2) the principal means of development" (Sen 2001). Sen is using a broad definition of freedom; he is not just referring to political rights, but the set of opportunities and the contextual capabilities that each individual possesses. He uses this argument to make the case that higher incomes, especially when distributed with some level of equity, contribute to development, but they are not an end in and of themselves and that the goal of development should be to expand human capabilities in a broader sense of the word. This expansion of development serves as one possible justification for looking at morbidity, mortality and access across a community, a country or globally: it grounds our sense of fairness in a well-articulated goal and pushes us to look beyond per capita GDP.

He compares this framework to what he calls 'utilitarian' and 'libertarian' perspectives on development; in the former, maximization of aggregate utility, proxied by maximization of aggregate income, serves as the goal; in the latter, there is an absolute prioritization of rights over incomes and opportunities. These two frameworks roughly follow economic justifications and human rights arguments, respectively. Sen's framework tries to balance both perspectives, allowing both income and non-income parameters to be used to measure progress.

Sen's framework is important for the research included in this dissertation not just because of the broad reach of his approach but because in it he put forward a participatory type of development model which focuses on the individual.

> *The ends and means of Development call for placing the perspective of freedom at the center of the stage. The people have to be seen, in this perspective, as being actively involved – given the opportunity – in shaping their own destiny, and not just as passive recipients of the fruits of cunning development programs (Sen 2001).*

Sen builds the idea of expanding freedoms on earlier work done by scholars such as Robert Chambers. In 1995, Chambers stated that “The challenge is to go beyond the normal agenda: beyond poverty to well-being, and beyond employment to sustainable livelihoods”(Chambers 1995). His definition of livelihoods, for example, emphasizes the resilience and freedom derived from the adoption by poor households of diverse strategies that often occur outside the institutions of formal employment. These strategies consist of many different activities which lead to the creation of goods, assets or income which is then shared by individual members of households, mediating risk to individuals. He set up this contrast in order to emphasize the individual perspective and lived experiences of the poor, and described how this differs from the policy priorities of economists and other development professionals. He advocated that the perspective of the poor be adopted by researchers and programming staff working in development, through active engagement and concerted effort towards listening and learning, rather than teaching and telling (Chambers 1995).

The active involvement of the end-user is vital to successful efforts of increasing access to water and sanitation, in particular. Approaches which are efficacious in producing safer water may not improve health outcomes with poor up take, or low frequency of use. Understanding access, affordability, user preferences and user behaviors are an important part of domestic water management policy and the design of public health interventions focused on drinking water systems (Mark D. Sobsey et al. 2008; D. Lantagne et al. 2008; Kot, Castleden, and Gagnon 2015; Rinehold et al. 2011). From this perspective, an analysis of domestic water systems necessarily needs to take into account more than water quality; they should include (a) the uptake and use of safe water systems among low-income consumers; (b) the costs of providing (and using) safe water systems; and (c) experimental and observational findings on user preferences and willingness to pay for, or walk to fetch, safe water. This broad scope acknowledges that technologies, their scale, their delivery models, their costs, user preferences, and usage rates, jointly determine the safety of water in the drinking cup.

In chapters one and two of this dissertation I provide a case study from urban India, in which understanding the perspective of the end-user is made a central part of the research in question; in chapter one I observe how informal behaviors at the household level continue after an upgrade to CWS, and the subsequent effects on drinking water quality. In chapter two, I look at user preferences and WTP in the same system, and find only partial overlap with the justifications given by policy documents which advocate for the upgrade to CWS. In chapter three, I present observations on user preferences and willingness to pay (WTP) for Household Water Treatment and Safe Storage (HWTS) in rural Tanzania. In all three chapters, I argue that improved outcomes will result if the perspective of the end-user is incorporated into the design of water policies in both Tanzania and India.

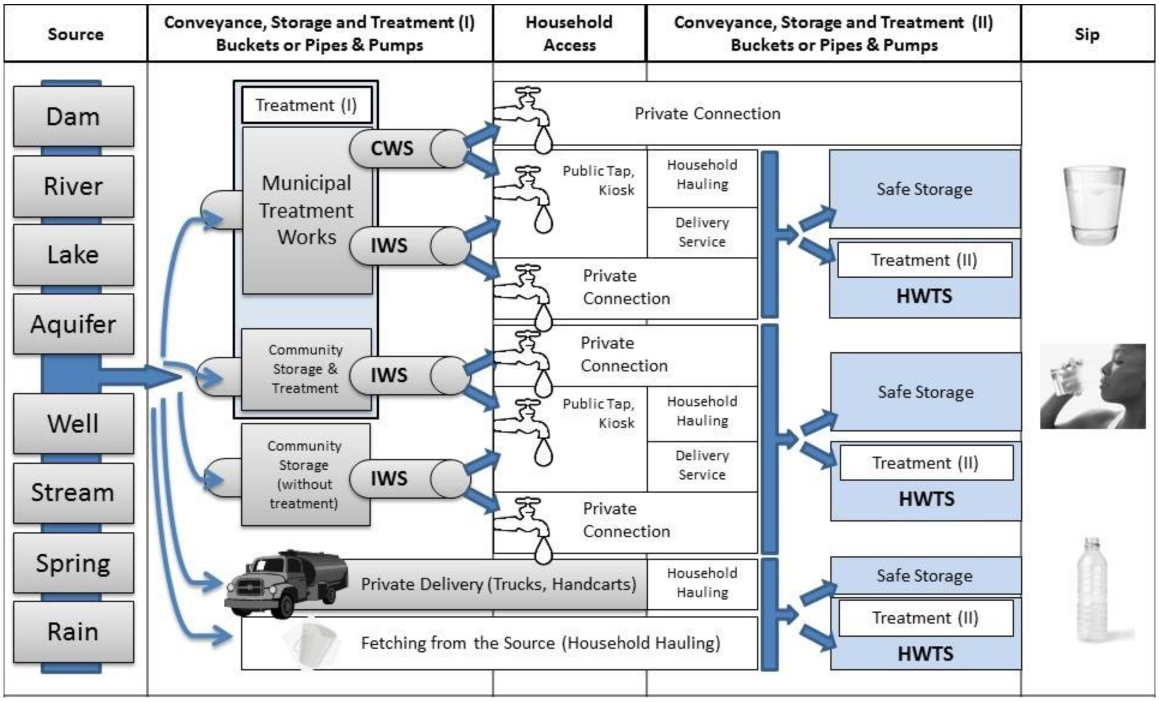
For the remainder of this introduction I provide two more sections, in order to provide the reader with a broader understanding of the context in which these case studies reside, before diving into the case studies themselves. First I present the source to sip (S2S) framing of safe water systems, a short section drawn from Amrose, Burt and Ray (2015) (Amrose, Burt, and Ray 2015). This is followed by a longer section, also derived from the same paper, in which I review the research literature of safe drinking water interventions in developing countries, including their effectiveness, and issues of uptake and sustained use. Interventions that have been shown to be effective at improving water quality or health in the field have been included.

1.2 Safe drinking water systems: from source to sip

Just as the end-user is at the center of the research presented here, the system which the end-user interacts with should be bounded in such a way as to include all aspects of water service delivery. Building on Amrose et al. 2015, I have taken a framing which views all safe water access as the product of one system or another. I consider *safe water systems from* S2S as a series of stages including treatment technologies, protection technologies, delivery models, and "last mile" labor before consumption. All safe drinking water systems contain five stages (1) source, (2) conveyance, storage (and sometimes treatment) from the source, (3) public or private access point for the household, (4) conveyance, storage (and sometimes treatment) beyond the access point and (5) consumption (sip). Treatment before access must be implemented by utilities or communities; after access treatment may be done by the household. Between these treatments the water is conveyed through pipes and pumps or hauled using buckets barrels, and trucks. All stages together determine the system's effectiveness and its cost, although safe water interventions can occur at one or more stages. The research literature mostly covers *technological approaches* in discrete stages between source and sip, i.e. in treatment, storage or conveyance within a safe water system, ignoring the interactions and interconnections between the five stages.

As an example of how I have used the S2S framework, in Hubli-Dharwad I have tried to incorporate household behavior, preferences and beliefs into my assessment of the local urban utility's piped water system. Likewise, in Tanzania I have explicitly looked at the effect of source water quality on household preferences. Although not exhaustive, I have made sure to draw out the relevant interconnections between the different stages of the local safe(r) water systems as they exist in each location.

Figure 1.1: "Source to Sip" Model. Interventions may focus on one stage in the system, but they always have interactions with the rest of the system into which they were introduced. Examples are given of papers that evaluate an intervention at a specific stage of the system (Taken from Amrose, Burt, and Ray 2015).



1.3 Household-based Approaches

Many new HWTS options were introduced, and existing ones evaluated in the field, between 1990 and 2000 which were explicitly designed for use in poor households in developing countries. These include chlorination(Tauxe, Mintz, and Quick 1995), solar disinfection (SODIS) (Conroy et al. 1996; Daniele S. Lantagne, Quick, and Mintz 2006), the ceramic pot filter (Daniele S. Lantagne, Quick, and Mintz 2006), and PuR (Souter et al. 2003). By 2001, articles and reports began emphasizing quality over just access, especially for rural communities (Mintz et al. 2001; T. F. Clasen and Cairncross 2004; Zwane and Kremer 2007). By 2007, the WHO had explicitly advocated HWTS for households without access to reliable piped water supplies, stating that HWTS could be effective in preventing diseases (World Health Organization 2007).

Any household without continuous piped water must store its drinking water. If the water is safe at the point of access, then safe storage may provide some protection against contamination in the home (Günther and Schipper 2013; Ercumen et al. 2015; Roberts et al. 2001). The CDC definition of a safe storage container includes (1) “a small opening with a lid or cover” and (2) “a spigot or small opening” for safe access to the water without hands or dipping cups or ladles having to touch the water (Department of Health and Human Services, Center for Disease Control 2011).

Some version of household water treatment is in use by more than 1 billion people worldwide. Different regions of the globe have different practices: 66.8% in the Western Pacific but only 18.2% in Africa. The vast majority of users (possibly 2/3 globally) practice boiling; chlorine disinfection is the second most common HWTS with 5.6% of all user households (Rosa and Clasen 2010). Significant contamination occurs at the ‘sip’ stage; cups can be contaminated even when washed (Rufener et al. 2010; Oswald et al. 2007).

Dilute sodium hypochlorite, tablets of sodium dichloroisocyanurate (NaDCC), and solid calcium hypochlorite all deliver free chlorine (Thomas Clasen and Edmondson 2006). PuR™, a Procter and Gamble sachet product, combines coagulation with disinfection (Souter et al. 2003). Filters include biosand filters, ceramic filters treated with colloidal silver, and the Lifestraw™ filter. The ceramic and biosand filters are neither standardized nor patented (Rayner, Skinner, and Lantagne 2013); Lifestraw filters combine physical filtration with chemical disinfection and are patented and standardized (Boisson et al. 2009). SODIS exposes water in polyethylene (PE) or polyethylene terephthalate (PET) bottles to direct sunlight for 2-30 hours (the range found in the literature for 3-log inactivation of *E. coli*) (Fisher, Iriarte, and Nelson 2012).

Not all HWTS are created equal. Treatment time, efficacy, the appearance of treated water and reliability vary with HWTS and source water quality. Only chlorine treatments offer residual protection beyond that provided by a safe storage container. Higher turbidity decreases the effectiveness of chlorination, while also increasing the risk of chlorinated organic compounds (D. S. Lantagne et al. 2008). The health effects of indoor air pollution from boiling using solid fuels are potentially serious (Anenberg et al. 2013). The effectiveness of SODIS is reduced by increased cloud cover and turbidity (Fisher, Iriarte, and Nelson 2012). UV lamps require electricity to operate and relatively clear water (Brownell et al. 2008). Whether or not ceramic filters treated with colloidal silver provide adequate protection against viruses is still unclear (van Halem et al. 2009; Brown and Sobsey 2010).

Even among HWTS that target low-income households, costs can vary, both in magnitude and means of payment. Filters, in particular require a high upfront financial cost, but no recurring financial costs for the life of the filter; consumables such as dilute sodium hypochlorite or PuR have low upfront financial costs, but do have regular replacement financial costs. Labor input, another form of “costs”, also varies across HWTS. Overall, each HWTS has its own pros and cons; there is no ‘best’ solution for all contexts.

1.4 Effectiveness: Household-based Approaches

Several meta-analyses have estimated the mean health impact (on diarrhea) of HWTS: all-ages relative risk of 0.65 across 12 randomized, controlled trial (RCT) studies(Fewtrell et al.

2005); 0.43 across six RCT studies(T. Clasen et al. 2007); and 0.56 across 28 studies, including RCTs and non-RCTs (Waddington and Snilstveit 2009). The meta-regression conducted by Wolf et al. estimated a protective effect of 0.55 – 0.62 for HWTS with filters, but no significant risk reduction for HWTS using chlorine or SODIS when adjusted for non-blinding bias. They also found that the use of safe storage did strengthen the protective effect of all HWTS included in their study (chlorine, SODIS, ceramic filters and biosand filters) (Wolf et al. 2014). Safe storage practices even without treatment can provide water quality and health benefits, for example in Benin (Günther and Schipper 2013) and Bangladesh (Ercumen et al. 2015). Brass containers have some anti-microbial properties (Brick et al. 2004).

In general, the effectiveness of HWTS in the field has a high degree of heterogeneity. Meta-analyses have estimated significant reductions in the risk of diarrhea for HWTS using chlorine, PuR and ceramic siphon filters impregnated with silver (T. Clasen et al. 2007; Arnold and Colford 2007). Lifestraw Personal appears less protective than ceramic filters; the biosand filter and ceramic pot filters show similar levels of protection (Boisson et al. 2009; Brown, Sobsey, and Loomis 2008; Stauber et al. 2012). An RCT of a SODIS intervention in Cambodia found the mean incidence rate ratios for non-dysentery diarrhea to be 0.38, respectively (McGuigan et al. 2011). Gruber et al. found no effect on diarrhea from a UV tube intervention, but their baseline incidence rates were already low (Gruber et al. 2013). Microbiological effectiveness in the field has only recently been measured for boiling. Reductions of 86.2%, 99% and 97% of thermotolerant coliforms were observed for boiled and stored drinking water in rural Guatemala, peri-urban India and rural Vietnam, respectively. The actual concentrations of coliforms in stored water after treatment were similar in all three studies (Thomas Clasen et al. 2008; Rosa, Miller, and Clasen 2010; T. F. Clasen et al. 2008; Psutka et al. 2011).

With these highly variable research designs and field results, many researchers have called for evaluating HWTS in blinded trials to minimize bias, and for using objective (as opposed to reported) outcome measures, such as mortality, weight gain and growth(T. Clasen et al. 2007; Schmidt and Cairncross 2009; Thomas Clasen et al. 2009). Blinding a SODIS, boiling or liquid chlorine trial would require complicated logistics (Preez, Conroy, and McGuigan 2012). For example, Kirchhoff achieved blinding for 20 households, by restricting administration of chlorine to hired research staff, rather than allowing households to administer treatment (Kirchhoff et al. 1985). But several studies have been able to blind, or even double- or triple-blind some HWTS, in low-income settings. Three more recent, large-scale, examples of this have found consistent water quality improvement, but none of have found any effect on diarrheal incidence (Boisson et al. 2013; Jain et al. 2010; Boisson et al. 2010).

There continues to be a lack of information about health impacts over the long-term and in non-intervention settings (Fewtrell et al. 2005),(T. Clasen et al. 2007). One rare example of longer-term follow up is Harshfield et al.; they randomly chose 201 households from a sodium hypochlorite program that had been running in rural Haiti for 8 years, compared them with 425 control households, and estimated a (mean) odds ratio of 0.41 for diarrheal incidence in children under the age of five (Harshfield et al. 2012).

No papers were found evaluating the health outcomes from boiling, which is surprising, given that an estimated ⅔ of people who currently use any HWTS, are boiling (Rosa and Clasen

2010). The variation in health impacts reflects variations in the implementation models across these studies, and also the multiple-pathway nature of diarrheal diseases (Fewtrell et al. 2005). Furthermore, even efficacious HWTS will not lead to positive health outcomes if they are not used correctly and consistently. And sustained use after the implementation of HWTS interventions has been poor, across the board.

1.5 Uptake and Sustained Use: Household Based Approaches

Uptake and usage of HWTS is not just important for the household treating their water; the effectiveness of any safe water system is dependent on uptake at the community level, as well. Expected health benefits drop when a household reverts to untreated water for even one day per year (Hunter, Zmirou-Navier, and Hartemann 2009); for high and moderately high contamination levels a decline in adherence from 100% to 90% reduces predicted health gains by 96% (Brown and Clasen 2012).

Many factors contribute to whether or not a household adopts and uses an HWTS. These include the flow rate (in filters), water quality, ease of use, financial costs, and supply chain requirements (Mark D. Sobsey et al. 2008). Other important factors include taste and smell (often conflated with water quality), affordability, and cultural practices (D. Lantagne et al. 2008). Social marketing, education and outreach methods may affect sustained use (e.g. Quick et al. 2002; Moser and Mosler 2008); this is an emerging area of research in the field. Psychological-social factors, such as knowledge, risk perceptions, and beliefs about health, also determine uptake and use (Mosler 2012).

Follow up studies looking at prevalence six months or more after the end of an intervention have found little or no residual effect on usage rates. In a meta-regression of the effectiveness of HWTS interventions, Hunter et al. find that SODIS, chlorination and coagulation-chlorination interventions lose effectiveness after 12 months, while ceramic filters remain effective (Hunter 2009). They suggest user drop-out, failure of the HWTS, and inability to purchase additional product as the reasons. Reductions in use have been found for PuR, boiling, chlorination and SODIS after six months (B. Arnold et al. 2009); and for the ceramic filter in rural Cambodia (mostly due to breakage) (Brown, Proum, and Sobsey 2009). One HWTS exception is a Lifestraw Family filter intervention that targeted HIV+ mothers in Zambia: 12 months later 90% of households reported using the filter (Peletz et al. 2013).

With limited evidence of sustained use (and thus effectiveness) of HWTS in general, Schmidt and Cairncross (Schmidt and Cairncross 2009) argued that the benefits for HWTS were low, and the 'acceptability' to target populations was unclear, while both were likely high for interventions that increased drinking water access. Clasen et al. responded that HWTS (mostly boiling) were already used by 850 million people in 58 low and middle income countries, indicating that other barriers were restricting scale up and sustained use (Thomas Clasen et al. 2009). Clearly, a better understanding of when and why households discontinue the use of HWTS, after initial adoption, is essential for effective interventions; absent this, serious doubts will remain on its scalability as a safe water approach.

Point-of-collection treatment at community systems may be more sustainable, though here, too, the evidence is mixed. Kremer et al. found that over 50% had confirmed chlorine residuals in their stored drinking water from a community chlorine dispenser in rural Kenya, two and a half years after the end of promotional activities (Kremer et al. 2011) (see also Pickering et al. 2015), with a shorter follow-up period in Bangladesh). However, deWilde et al. found low use (and no impact on diarrheal incidence) in a point-of-collection UV intervention in rural Mexico, five years after the program began (deWilde et al. 2008).

1.6 Centralized Piped Network and Community-based Approaches

Piped water access in the 'user's dwelling, plot or yard' is the most improved form of access tracked by the Joint Monitoring Programme, co-administered by the WHO and UNICEF: globally 58% of people had piped water in 2015 (WHO/UNICEF 2015). When non-piped sources are of inferior quality, increasing the number of households connected to an urban piped water network can be an effective safe(r) water intervention (Semenza et al. 1998). Improving municipal treatment, protecting water quality in the distribution network, and converting from intermittent water service (IWS) to continuous water service (CWS) all improve drinking water quality for connected households (Galiani, Gertler, and Schargrodsky 2005; Kumpel and Nelson 2013; (Lee and Schwab 2005).

In addition to piped water access, "public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection" are also classified as "improved"; globally 33% of the population had access to these in 2015 (WHO/UNICEF 2015). Sources that are "improved" may not be free of fecal contamination: in a review of 319 studies on water sources, 38% of the studies reported "improved" sources that had fecal contamination more than 25% of the time (Bain et al. 2014). Water quality interventions in community systems often focus on discrete stages of a 'source to sip' system; for example the creation of new sources, source protection, treatment, or improved distribution networks. Systems that provide several of these steps resemble small utilities, and may therefore take on some of their characteristics, such as the professionalization of operators and managers and investment in some of the same treatment technologies.

1.7 Effectiveness: Centralized Piped Network and Community-based Approaches

Several studies have looked at the protective effect of improved sources; in general they found improved sources did have better water quality, but such sources were no guarantee of safe drinking water without additional treatment. For example, in Cambodia 47% of piped water sources and 30% of non-piped stored water met these criteria (Shaheed et al. 2014). In Vietnam the mean adjusted longitudinal prevalence ratio for diarrhea for households with a piped water connection, compared to those without piped water, was 0.57 (Brown et al. 2013). Wolf et al. pooled data from 61 interventions and through a meta-regression found no statistically significant effect on diarrhea from the use of improved sources compared to unimproved sources (Wolf et al. 2014).

Very few evaluations of interventions in centralized piped networks in developing countries reported water quality or health impact. Semenza et al. found non-piped access with household treatment to have the lowest rates of diarrheal illness in Uzbekistan, but piped access had superior health outcomes compared to non-piped access with no treatment (Semenza et al. 1998). A matched comparison study from India found that whereas 31.7% of tap samples from IWS areas tested positive for *E. coli*, only 0.7% of samples from CWS areas did (Kumpel and Nelson

2013). Galiani et al. (Galiani, Gertler, and Schargrodsky 2005) found that expanded network coverage in Argentina, especially in poor areas, led to an 8% decrease in child mortality. It was not clear how much increased access versus improved quality contributed to this health impact. The meta-regression conducted by Wolf et al. found a protective effect from continuous piped water access compared to all other types of access, but interventions that provided basic, intermittent piped water access also improved health outcomes when compared to access to unimproved sources (Wolf et al. 2014).

1.8 Uptake and Sustained Use: Centralized Piped Network and Community-based Approaches

In Morocco Devoto et al. (2011) and in Tunisia McPhail (1994), both found that the largest deterrent to establishing a new private connection to the piped water network was the size of the connection fee (Devoto et al. 2011; (A. A. McPhail 1994). In Kerala Griffin et al. (1995) observed that, in addition to the size of the connection fee, household characteristics, such as income and education, as well as local water scarcity, played a role in the decision to connect, but the piped network's service quality did not (Griffin et al. 1995). In Sri Lanka, Pattanayak et al. (2006) found that in addition to the size of the connection fee, and key household characteristics, the presence of substitutes, in the form of secondary sources, also dampened demand for a private connection, provided the water quality in the secondary source was perceived to be good. In addition, they found that households were less likely to connect if the utility were to be privatized (Pattanayak et al. 2006).

Piped water from a private household connection is in general more convenient and safer than non-piped sources (Yang et al. 2013). Usually households with a private connection to a piped network, once connected, will not choose one day to disconnect from the system. But after a connection is established, water quality is still mediated by household behavior; under IWS use of a HWTS is necessary to guarantee water quality; under CWS water should be drunk directly from the tap in order to preserve water quality. Therefore access to safe and clean drinking water depends on sustained, correct household behavior which is more narrowly defined than simply having a connection, and varies according to delivery regime. Under IWS, the required behavior includes household treatment and safe storage which has already been reviewed, above.

As far as I know, only one study so far has looked at whether the correct behavior (drinking directly from the tap) is sustained under CWS: Burt and Ray (2014). This paper describes an example of households which were converted from IWS to CWS, in Hubli-Dharwad, India. The vast majority of these households were observed to continue the same water storage behaviors under CWS which they had established under IWS, thereby negating the water quality improvements attributable to the service upgrade. This paper constitutes chapter one of this dissertation.

1.9 Expanding Freedoms and Safe Drinking Water

Sen's framework of expanding freedoms provides a theoretical framework and justification both for development work, and also for an evaluation of the impact of development projects that is more than just a sum of the human rights framework and the economic growth framework. By motivating development through the perspective of the individual, Sen, as well as Chambers, push us to engage with the least fortunate and use their experiences and preferences to guide our work.

Naturally, when we talk about the basic necessities of life, water is at the top of the list. Therefore finding ways of expanding access to safe drinking water is a way of expanding freedoms for any person who is currently lacking such access. Even with our individualist perspective, for the most basic of necessities, we find a universal truth and a standard for evaluation that penetrates any local peculiarities. While other freedoms may be valued and prioritized more or less depending on the person, place and time, the freedoms which come from safe drinking water can never be doubted.

In this regard, invoking Sen does little more than provide a backdrop for our efforts. But the perspective of the individual indeed does more than simply provide a more holistic or compelling approach to development: for projects which strive towards improved access to safe water for the least fortunate among us, it is the aggregation of individual perspectives which is now needed in order to create more efficient, environmentally sustainable and economically successful, water management systems, at all scales, whether for households, communities or large municipalities. Understanding end-user perspectives allows us to understand why a new HWTS is not being used, or why households might continue to store after CWS has been implemented, for example. Evaluating water intervention projects not based on their potential, but on the real impact that they have, requires us to learn from end-users, in much the same way that Sen and Chambers before him implored us to do. Therefore I have focused on the individual and collected observations based on the end-user's valuation of water, water access and water treatment, not just because water is a basic necessity, but also because I felt such work was a vital part of improving how we allocate and improve our most precious resource.

In this dissertation I focused on two different case studies: one in rural Tanzania and the other in urban India; in the next three chapters, I use my two case studies to argue that my research, and any research that uses the end-users perspective, is vital to improving water management and public health policy. The results from Tanzania are relevant for other countries in Sub-Saharan Africa, as well as other developing regions with limited access to improved water sources and high rates of turbidity. The results from Hubli-Dharwad are relevant to other urban areas in South Asia, and IWS piped water networks in other developing regions as well.

My research in both locations contributes to the literature on user preferences and WTP for water services. For the HWTS literature, my research addresses questions about why some HWTS interventions may have failed to scale up to a larger population or to sustain usage among participating households over time. The user preferences and WTP analysis for in Hubli-Dharwad sheds light on what piped water services are valued by end-users, and gives some indications on whether and when they should be pursued, adding to the research literature concerning urban utility management and informal urban services. For both locations I conducted my research and analysis with current policy debates in mind, and gave recommendations for both future research as well as the local management of domestic water systems.

2 Storage and Non-Payment: Persistent Informalities within the Formal Water Supply of Hubli-Dharwad, India[1]

Abstract

Urban water systems in Asia and Africa mostly provide intermittent rather than continuous water supplies; such systems compromise water quality and inconvenience the user. Starting in 2008, an upgrade to continuous (24/7) water services was provided for 10% of the twin cities of Hubli-Dharwad, India, through a process of privatization and formalization. In this paper, 'formalization' of water provision includes expanding the piped network, improving the network so that it allows for continuous water supply, enhancing water quality, registering new (or existing but unregistered) customers and fencing off artisanal sources. The goals were to improve water quality, free consumers from collecting and storing water, and reduce non-revenue (i.e. unpaid for) water. Drawing on household surveys (n = 1986) conducted in 2010-2011 in the 24/7 zones, as well as on a range of interviews, we find that, even with 'formal' 24/7 water service, most consumers continue the supposedly 'informal' practices of in-home storage and water use without payment of bills. We argue that multiple unaccounted-for factors – including a history of distrust between the consumer and the utility, seemingly small infrastructural details, resistance to higher tariffs, and valuing convenience above water quality – have kept these informal practices embedded within the formalized delivery system. Our research contributes to understanding why formalization may only partially supplant informal practices even when the formal system is functional and reliable.

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[1] Co-authored with Isha Ray

Keywords
Informality, water supply, drinking water storage, non-payment, quiet encroachment, continuous water supply, 24/7 water

2.1 Introduction

Urban water supplies are commonly classified as formal versus informal. A formal system usually means piped delivery of treated water regulated by a utility. An informal system usually implies a set of alternative water delivery mechanisms and practices largely unregulated by a state entity. In developed country cities, most consumers are served by the formal sector, but in the developing world, alternative means are the norm (Watkins 2006). Historically, as piped and treated water systems have expanded to serve urban centres and their growing populations, the alternative mechanisms have gradually been supplanted. Developing country urban water supplies are being built or expanded with this same model in mind. The city planner's assumption seems to be that, as pipes get laid, water gets treated, services improve from intermittent to continuous supply, and billing and metering expand, fewer and fewer consumers will come to rely on neighbours' taps, vended water, street-corner hand pumps, storage containers and illicit connections.

In this paper, we examine the impacts of an expanding and increasingly formal piped water network on informal access practices. Our case study is a pilot project in Hubli-Dharwad, Karnataka, called the Karnataka Urban Water Services Improvement Project (KUWASIP). KUWASIP is a public-private partnership (PPP) with the stated goals of improving reliability, convenience, water quality and utility revenues. In common with most Indian cities, Hubli-Dharwad's piped system provides intermittent rather than continuous water flows. The residents cope with intermittency using various means, including buying water from tankers, carrying water from public bore wells, storing water at home between supply periods, or constructing unauthorized connections for which they do not pay (Bakker 2003; Kumpel and Nelson 2013). Since 2008, KUWASIP has regularized all household water connections and brought continuous water delivery to eight out of 67 wards in the twin cities of Hubli-Dharwad, covering 10% of all residents. Locally, this project is known as '24/7', since it provides water 24 hours a day, 7 days a week. KUWASIP's is a remarkable achievement; it marks one of India's first attempts to replicate the piped network standards typically found in developed countries. KUWASIP's project documentation argued that households that could access water from the formal 24/7 network would take full advantage of improved convenience, quality and reliability, and would be willing to pay for these amenities (World Bank 2004). This does not match our observations in Hubli-Dharwad. We found that the informal (meaning, unregulated and outside the domain of the formal system) provision of convenience through in-home storage persists despite the improvements offered by the formal network. In fact, we saw the coexistence of the formal and informal not just at the neighborhood scale, as described by Bakker (2003), but within the household itself. Multiple interacting factors – including distrust between the consumer and the utility, habits, valuing convenience above water quality and the seemingly small matter of where the household tap is located – have allowed storage to persist *even within a well-functioning piped system*. To show how and why informal practices have remained embedded in Hubli-Dharwad's formalized and functioning water delivery system, we begin with a brief overview of the formal and the informal, in the urban studies literature more broadly, and in Hubli-Dharwad specifically.

Informality and urban water supply

The term 'informal' has eluded easy definition in the literature on urban politics and planning, as many of the papers in this volume confirm. Throughout the 1970s, when the concept of 'the informal sector' (see Hart 1973) first emerged, it stood for unregulated urban activities, the boundary of the legal and the illegal, the unprotected, the makeshift, or simply casual economic activities undertaken by poor people. It generally implied the 'lack' of regulated activity or services with which the poor had to 'cope' with. As early as 1978, Bromley argued that the dualism of formal/informal was inappropriate, but had gained traction because it seemed to offer safe policy choices for less-than-radical countries (Bromley 1978). But the mainstream urban studies literature continued to treat 'the informal' as a catchall category that stood in opposition to a well-defined 'formal' (AlSayyad 2004).

This binary conceptualization, suggesting that informal service is everything that the formal is not, has been repeatedly challenged, and from multiple standpoints. Urban informality has been conceptualized as a set of spontaneous and entrepreneurial survival strategies pursued by the poor (De Soto 2000); as a particular 'mode of urbanization' in the modern city rather than as the absence of regulation (AlSayyad 2004); or as a way for the poor to seek services and recognition on their own terms as opposed to on the terms of the urban elite (Appadurai 2001). Following Foucault's concept of power as circulating or decentralized, the informal – and potentially extra-legal – activities of the urban poor have recently been re-conceptualized as resistance to the rule of the urban elite (Foucault 1980). In these works (e.g. (Innes, Connick, and Booher 2007; Grigorovich 2008) urban informality is considered as a mode of urban living, and not necessarily in a dichotomous relationship to a well-defined formal.

Informal practices with respect to urban water specifically have also been explained as resistance to prevailing power structures. Loftus (2006) frames non-payment, protests against flow-restricting technologies at the tap, and night-time plumbers who reconnect the disconnected in Durban, as forms of resistance to the power of the water meter and, by extension, of those who control it (Loftus 2006). In Tijuana, Mexico, Meehan (2013) reports that households continue to use "ordinary infrastructures" such as rainwater harvesting and grey-water barrels, despite a functioning municipal supply, in part to save money, but in part because the resident feels in control of the water that she herself collects and manages (Meehan 2014).

Walking a line between the passive coping and the active resistance paradigms, Bayat's model of the informal is that of the "quiet encroachment of the ordinary" (Bayat 2000), through which the urban poor, without noise and fury, go about the business of acquiring land, or bypassing regularized channels for urban services. He observes that "many poor people tap electricity and running water illegally from the municipality despite their awareness of their illegal behavior" (ibid: 543). Kudva (2009), in a study of Delhi and Ahmedabad, builds on this concept to argue that such everyday resistance continues even when 'punctuated' by periodic expulsion from the system (Kudva 2009). Access through quiet encroachment may also be enabled – at a price – by the locally powerful or politically affiliated, resulting in the sort of 'informal formalization' observed in Dhaka's slums (Hackenbroch and Hossain 2012).

In this study of Hubli-Dharwad, we borrow Bayat's understanding of informality-as-encroachment to explain access to municipal water without payment. Many low- to middle-income residents with registered private taps rely on municipal water but do not pay their bills

(The Times of India 2012b). Access to the municipal network itself may be illicit; pipes are hacked, and the resulting holes are connected to taps or simply plugged up using rags and tape. Non-registered connections are also an example of access by stealth (though they are stealthy only with respect to the utility: our study households made no attempt to obscure the holes hacked into the municipal pipes). Despite Bayat's claim that quiet encroachers take from powerful institutions and not from their fellow disenfranchised, a hole in a pipe will, in fact, reduce the neighborhood's water pressure and cause the potential infiltration of polluted water. We therefore argue that, in the case of an urban water system, 'quiet encroachment' modes of access do impose direct costs on the poor, though the intent may be to take only from the state or private company.

These nuanced approaches to defining the informal and the work of informality have not been mainstreamed into urban water policy and planning. It is well known that most urban residents in developing countries are not served by piped and pressurized water systems, and these systems may not be feasible for all under current water policies (e.g. Bakker et al. 2008). A hybrid mixture of vended, public, negotiated, illicit and self-provisioned sources remains the only option for the politically and geographically marginalized (e.g. Crane 1994; Kjellen 2000; Swyngedouw 2004; Conan, Andrews, and Weitz 2003; Schaub-Jones 2008; Ranganathan, Kamath, and Baindur 2009; Dasappa-Kacker and Joshi 2012). Yet such systems are routinely considered prerequisites of modern urban life, as Bakker (2003) points out. The urban planning literature, while accepting the need for informal water suppliers where the utilities cannot (or, less openly admitted), do not want to go, treats these mechanisms as interim options, en route to, one day, piped water supply from a utility.

Bakker (2003) describes the reality of water provision in developing countries as a mix of overlapping strategies rather than as a linear transition from artisanal, community-based modes of provision (e.g. public wells or vendors) to more industrial and corporate forms (e.g. centralized, treated, piped water networks). A city develops 'archipelagos' of formal service; Bakker argues that the formal and the informal coexist because the formal system is spatially uneven, and that, where industrialization levels are low, informal modes of water access will prevail. In this paper, 'formalization' of water provision includes expanding the piped network, improving the network so that it allows for continuous water supply, enhancing water quality, registering new (or existing but unregistered) customers and fencing off artisanal sources.

In the twin cities of Hubli-Dharwad we find that, even where the water flows through the piped network into the customers' taps, the formal and the informal continue to coexist. Our household survey in the 24/7 KUWASIP-served zones showed that most residents continue to store water, a classically 'informal' practice common to neighborhoods with no piped, or only intermittent piped, supply. Through our detailed study of in-home water storage and non-payment of water bills, we analyze how and why this particular formalization project has succeeded, but has also remained incomplete.

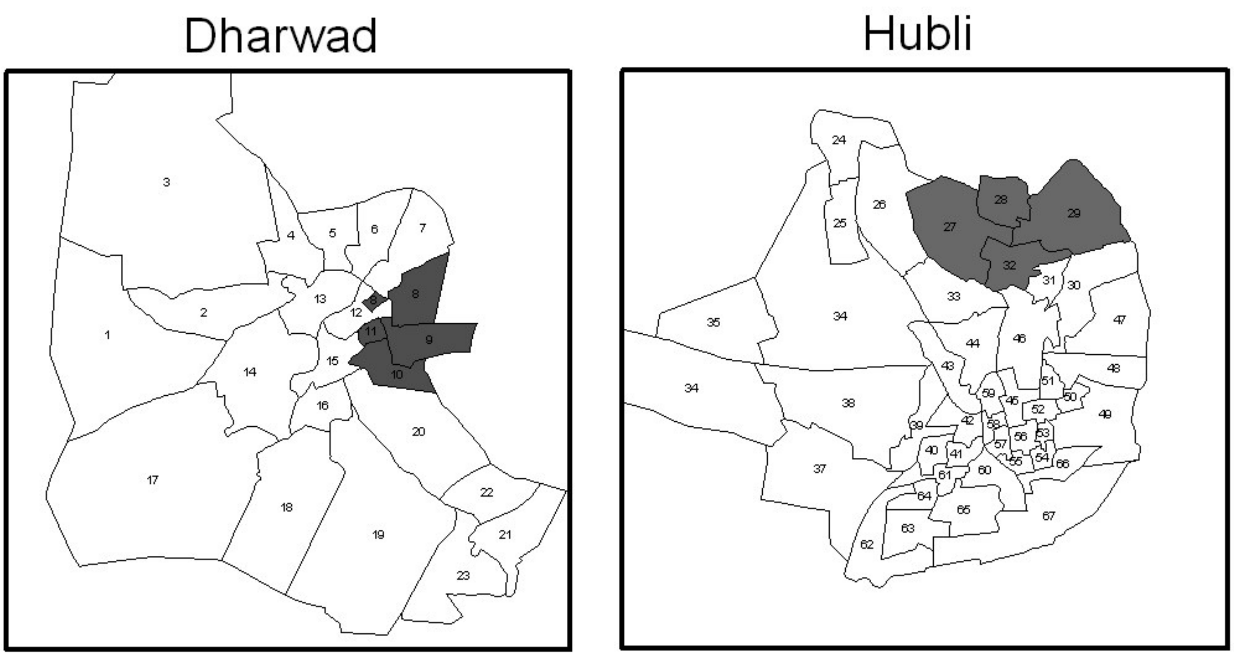
Municipal water in Hubli-Dharwad: Increasing formalization but continued intermittency

The city centres of Hubli and Dharwad are separated by a mere 20 kilometres. The twin cities have a combined population second only to Bangalore among cities in Karnataka; the 2011 census estimated that a population of nearly a million lives in Hubli-Dharwad. The cities source almost all their municipal piped water from the Malaprabha River and the Neer Sagar Lake. The water system has a design capacity of 130 MLD (million litres per day), but after leakages, supplies approximately 70 MLD to consumers (Wilbur Smith Associates Pvt. Ltd. 2003). The current piped water network was initiated in 1956, and provided a continuous water supply for the urban population of that time (Wilbur Smith Associates Pvt. Ltd. 2003). As urbanisation increased, the cities slowly outgrew their water system, resulting in intermittent water delivery. Tariffs did not cover the costs of operations and maintenance (O&M), nor allow for adequate expansion of the piped network. A volumetric rate was adopted in 1996 for the minority of houses that were metered, but all other registered connections continued to pay a monthly flat rate (World Bank 2004). By 2001-02 collected revenues covered only 19% of O&M costs (World Bank 2004), and illegitimate (i.e. informal) connections had become commonplace in low-income areas.

Daily deliveries eventually became weekly deliveries and, at the height of scarcity during the dry seasons of 2001 and 2002, regular deliveries occurred only once every 12-15 days (The Times of India 2002a); Franceys and Jalakam 2010). This fomented massive outrage among residents. Bayat's quiet encroachment is normally a series of individual acts, shunning collective demand-making in pursuit of shared goals. He argues, however, that these same quiet masses may take to the streets, if their hard-won gains are threatened, or as part of a "general expression of popular discontent" (ibid: 548). In this instance, not long before he was replaced, the Chief Executive Engineer of the Hubli-Dharwad Municipal Corporation (HDMC) was brought out of his office and tied to a pole as part of a public shaming executed by mobs of angry residents (personal correspondence). This reaction at the failure of the government-run utility established the power of the insurgent masses and has not been forgotten.

Figure 2.1: Map of India, indicating the location of Karnataka State and Hubli-Dharwad city (adapted from "India Karnataka Locator Map" 2014).

Figure 2.2: Maps of Hubli and Dharwad. Ward boundaries are shown; the 24/7 wards are shaded. Wards lying between the two city centers have been omitted.



In order to quell angry residents the Water Resources Minister announced on March 17, 2002, that the frequency of water delivery would be increased to once in five days by March 30 (The Times of India 2002a). By April of that year, HDMC officials admitted that once in five days would not be feasible but that once a week was "possible" (The Times of India 2002b). On April 1 2003, the HDMC had to hand over all O&M of the water system to the Karnataka Urban Water Supply and Sewerage Board (KUWSSB), a state-level rather than a city-level body (The Times of India 2003). Almost immediately, the KUWSSB began investing in infrastructure, advocating for a tariff increase and crafting a program for the regularization of illicit connections. The HDMC still owned the water rights, was ultimately responsible for all costs incurred, and had the right to approve or deny any changes in tariffs. But it was the KUWSSB that was charged with increasing revenues and improving services.

Change was gradual, but, as of 2005, water was being delivered once every six days, and tariffs, although still low, had been doubled. The flat residential rate per month went from Rs 45 (US$ 0.82) to Rs 90 (US$ 1.64) in 2007, which is where it stands today (The Hindu 2005a; Sangameswaran, Madhav, and D'Rozario 2008). By 2011 approximately 70% of registered connections had been put on meters (The Hindu 2005b; The Hindu 2011). In 2004, the Karnataka Urban Infrastructure Development & Finance Corporation (KUIDFC) estimated that 45% of households had a registered private connection, and 25% of households accessed municipal water from a public standpipe (World Bank 2004: 92). The bill collection rate started to rise, and investments in infrastructure enabled improved water delivery frequencies (The Times of India 2003; World Bank 2004; QualityTonnes 2004). Overall, formalization increased with the changes made by KUWSSB; as a result, water deliveries improved and tariffs went up, although the municipal water supply remained intermittent.

In March 2003, the World Bank came to visit the HDMC to discuss large-scale water investments. The Initial Project Information Document for the Karnataka Urban Water Supply Improvement Project (KUWASIP) was approved the following January. The project was to provide 24/7 water in place of intermittent supply in demonstration zones, covering 5-10% of the population, in three cities of northern Karnataka: Gulbarga, Belgaum and Hubli-Dharwad. KUWASIP is a PPP, implemented in concert with the KUIDFC (a parastatal) and the KUWSSB, the state agency managing the local water utility. Based on its competitive bid, Veolia Water, a division of Veolia Environnement (France), was awarded the management and maintenance contract for two years (Franceys and Jalakam 2010).

The 24/7 zones were set up in four contiguous wards of Hubli and four more in Dharwad; the wards were chosen based on the ease with which they might be hydraulically isolated from the rest of the piped water network. According to the KUIDFC, these zones, when taken together, cut across all income groups (Wilbur Smith Associates Pvt. Ltd. 2003). Our research team walked extensively in the 24/7 zone wards in order to create detailed maps of the areas to be sampled, and visually verified that low, middle and high-income neighborhoods seemed to be well represented in the 24/7 zones.

In the official Project Appraisal Document, the World Bank stated that providing continuous (24/7), instead of intermittent, water was done with many goals in mind, including improved water quality, time-savings for residents who otherwise have to collect and store water, and cost recovery for the utility (World Bank 2004). Local advocacy groups protested what they saw as a move towards privatization, citing a lack of transparency and a loss of control over setting the tariff structure (Sangameswaran, Madhav, and D'Rozario 2008). Some residents worried that involving the private sector would reduce access for the poor who would not be able to afford the increased tariffs. Others argued that a private company might provide improved services, a highly desirable outcome. Sangameswaran et al. (2008: 63) report that:

> *…there were people (usually those with adequate storage facilities and/or access to groundwater) who said that the board's supply (…) was more than enough; others welcomed 24/7 since it would eliminate the need to store water. Some slum-dwellers (…) felt that the implementation of 24/7 was in response to their demands for more regular water, since the poor stand to lose the most (in terms of time and wages foregone) when water is irregular and intermittent.*

This observation shows the stress faced by low-income storers, who literally have to babysit their taps, versus the near-continuous supply that the higher-income storers can self-provide (Woelfle-Erskine 2012).

KUWASIP sought to change the terms of agreement between the municipal corporation and residents by promising "international standards", and by encouraging water users to treat their water as a commercial product and think of themselves as water consumers. The project aimed to make all connections within the 24/7 zones formal, improve reliability, and foster the development of "autonomous, customer responsive and commercially-oriented utilities, including effective public-private partnerships" (World Bank, 2004: 3). Stated goals of the pilot also included streamlined revenue collection, minimization of leaks within the network and elimination of public, and hitherto free, standpipes. All of these efforts were ultimately aimed at decreased non-revenue water and therefore improvement in the utility's ability to cover the cost of service.

Protests against the municipal water system continued under KUWASIP. The original tariff structure proposed for the pilot project areas had to be revised due to public objections to the steep increase in rates. When the revised tariff structure was agreed upon, it was made retroactive, and those customers in the pilot zones that had bills in excess of Rs 200 between January 1 2008 and June 30 2009 received a refund (The Times of India 2012a). The final domestic tariff structure had a minimum charge of Rs 48 for up to 8 kiloliters (kl) of water per household per month, rising at increasing volumetric rates to Rs 20/kl for each kiloliter per month above 25.

According to the KUWSSB, nearly all households with formerly illegitimate connections have been regularized and given meters, and are now receiving monthly bills. At the same time, access to public water sources, which provided low-quality but free water in the 24/7 zones, has been greatly reduced. All 84 hand-pumps, an unspecified number of the 110 motorized bore wells, and all 115 public stand-posts are now closed. Unkal Lake, the largest surface water body within Hubli's city limits, once freely available for non-potable uses and for domestic buffalos, has been fenced off. Access to this 'recreational area' now requires a nominal fee.

Overall, KUWASIP has achieved significant successes with respect to the goals of the 24/7 project. Previous research has analyzed other goals of KUWASIP, namely improved water quality and a subsequent improvement in health; comparing 24/7 and intermittent areas, Kumpel and Nelson (2013) found improved water quality; Ercumen et al. (forthcoming) found a decrease in typhoid, and a decrease in dysentery among children under the age of five living in below median wealth households (Kumpel and Nelson 2013; Ercumen 2013). Here we try to address the question of whether increased water flows and regularization has indeed led to increased reliability and convenience, and whether this has made the informal 'coping' practices of in-home storage and illicit piped water use redundant. In other words, was the upgrade to 24/7 water supply living up to these *ex ante* expectations?

2.2 Methods

We developed a survey instrument to understand the impact of KUWASIP's intervention at the household level. We conducted our survey with a random sample of households, all with children under five years of age (n = 1986 households), from KUWASIP's eight demonstration wards. To compare the water use practices in the rest of the city with those of the 24/7 zones, we also surveyed households in the intermittent zones (n = 1951).

This household survey was part of a larger project aiming to make a comprehensive assessment of the impacts of KUWASIP in Hubli-Dharwad, evaluating health, water quality as well as household finances and willingness-to-pay for improved water services. We extensively piloted the survey instrument in order to ensure that it reflected the specific ways in which people used water in Hubli-Dharwad. We also collected information on the socio-economic status (SES) and demographic characteristics of all households. In this paper, we report our observations concerning SES, storage and non-payment from that larger, comprehensive data set.

We divided each of the eight wards into clusters, i.e. zones within the ward that displayed homogeneous economic and demographic make-up (determined qualitatively by visual inspection), and separated from other zones through roads, fields or other physical barriers. We attempted to enroll 250 participants from each ward; the number of participants enrolled in each cluster was determined based on the population density of the cluster in order to obtain a representative sample of the ward. The sample was sized in order to provide 80% power to detect a 30% (three percentage-point) reduction in diarrhea associated with continuous supply, with a one-sided α of 0.05 (see Ercumen 2013 for further discussion of the power calculation). We took GPS coordinates for all houses and checked to make sure that the participating households were taken from every neighborhood present in all study wards. A subset of these houses (n = 350), participated in a longer survey that included measurement of the height and diameter of all of their storage containers. We instructed our enumerators to conduct this container survey in the first household that they visited for each day of fieldwork. We conducted this container survey in order to estimate the types and volumes of containers that were in regular use. We used these volume data in our analysis of storage in 24/7 households.

In order to compare the impacts of KUWASIP's intervention, we conducted a very similar household survey in the intermittent areas of Hubli-Dharwad (n = 1951). These households were selected in order to control for known confounders using a quasi-experimental approach called genetic matching (Sekhon and Grieve 2008). Genetic matching is a statistical algorithm which minimizes the difference between key household characteristics of intervention and control wards. In this paper, our analysis focuses on storage and non-payment within the 24/7 areas; we use information from the intermittent zone survey to contextualise water access in Hubli-

Dharwad more generally. We followed up the survey data with open-ended interviews with a small subset of 24/7 households, in order to understand the reasons for the behaviors reported in the household survey.

We conducted four rounds of data collection over the course of 14 months from December 2010 to February 2012. We trained our research team to conduct the survey using the Open Data Kit (ODK) software, run on Android phones (Hartung et al. 2010). The individual forms were downloaded onto a single designated computer at the end of each day of fieldwork, and aggregated into a single csv database using the ODK Aggregate software. We performed data checks on the aggregated data on a daily basis. For the container survey, measurements were made using a locally purchased measuring tape, and recorded on a paper survey form. We hired two data entry personnel; all of the paper survey data was entered in duplicate allowing us to compare each version for accuracy. Once data collection was completed, the aggregation of the paper survey data with the ODK database, all data cleaning, analysis and the production of data tables were done using R (R Core Team 2012). Maps were produced using ArcGIS (ESRI 2011).

Ethics

Participants were briefed as to the details of the study and given the opportunity to ask questions and receive answers to those questions. Enumerators obtained informed verbal consent from each respondent prior to inclusion in the study. Our research protocol was approved for ethical compliance by both the University of California at Berkeley's Office for the Protection of Human Subjects and the Center for Multi-Disciplinary Research, Dharwad, India.

2.3 Results and Discussion

Current Water Access in Intermittent Areas

Throughout the slow decline as well as the incremental improvements, households adapted to the shifting levels of service through myriad ways, as shown by our observations on water access in the intermittent areas. Intermittent water deliveries mean that households have to collect, store and (possibly) treat their water, and these options vary greatly in terms of investment cost, time requirements, storage capacity and water quality. Informal methods of creating continuous, or at least more reliable, water access abound in Hubli-Dharwad. Following Woelfle-Erskine's (2012) typology of water access and coping mechanisms, our own research team found that water access could be roughly characterized into three types: 1) shared public taps, 2) private taps but no overhead storage tanks, and 3) both private taps and overhead tanks. The most inconvenient mechanisms, shared standpipes, used either by a small or a large number of families, are observed only in low-income neighborhoods. Households with a private tap (legitimate or not) but no overhead tank correspond with the better-off low-income households, as well as some middle-income households. Overhead tanks allow for the most convenient forms of access, mimicking continuous piped water, and are available almost exclusively to upper income households. In all these cases, collection and storage for the sake of reliability and ease of access are informal services provided from within the household.

Table 2.1 shows the number of households that we observed in the intermittent areas of our study in each of these three water access types, separated by wealth category. All three types span the median level of wealth found in Hubli-Dharwad, but a rough correlation exists between wealth and improved convenience of water access.

Table 2.1: Water access type by percentage of population and wealth category, Hubli-Dharwad, IWS Zones.

	Shared standpipe	Private tap	Private tap with overhead tank	All access types
Below median wealth	9.8%	82.1%	8.1%	100%
Above median wealth	2.9%	37.6%	59.6%	100%

Adaptations to the decline of piped water services were not restricted to licit measures. Our survey data from the intermittent areas (i.e. areas of the city not in the 24/7 zones) indicated that approximately 10% of households had some form of private piped water access for which they did not pay a connection fee and do not pay any monthly charges. The use of these (mostly) illegitimate connections is also correlated with income; in our survey 16% of below median income households, but only 5% of above median households, used such connections.

The persistence of the informal in 'formal' Hubli-Dharwad

Our surveys in the 24/7 wards showed that service through the formal network has remained almost uninterrupted in the demonstration zones since the launch of operations. Overall, KUWASIP has achieved significant successes with respect to the goals of the 24/7 project. Yet formalization remains incomplete: our study finds that the creation of continuous, reliable water access for all has not ended informal storage practices, and that regular metering and billing have not led to all customers paying the utility. Informal practices remain tenaciously entrenched, despite 24/7's "international standards".

Registering water connections, removing free standpipes, shutting down public bore wells, metering, and the timely issuance of monthly water bills were all part of the 24/7 process and they each contributed to the increase in revenues collected by the utility. But in Hubli-Dharwad, "overlapping strategies" (Bakker, 2003) and "quiet encroachment" (Bayat, 2000) persist, in the form of storage and non-payment, even *within* the service areas of the functional and reliable formal water delivery system.

The continuation of storage

Other than price, the four significant aspects of water supply that determine a customer's satisfaction, and possibly willingness to pay, are quantity, quality, convenience and reliability. 'Convenience' means a reasonable hour of delivery (for example, 7 a.m. was a good time for many of our survey respondents), low effort expended during collection, and water easily within reach when the household needs it. 'Reliability' means both knowing when the water will arrive and knowing that the household will not run out between arrivals. Formalization often aims to improve water services along all four dimensions but may or may not do so. When KUWSSB took over operations in Hubli-Dharwad, it increased the quantity available and decreased the time it took to collect water. But it did not improve the convenience of the hour of delivery – water users had no choice. Nor did it improve the reliability of delivery: people sometimes had to wait hours for the water to arrive, and were unsure of when it would arrive next. In our survey of intermittent areas, we found the times of delivery occurred at all hours of the day and night and on average our interviewees spend 14 hours per month waiting for late deliveries to arrive. In this situation, all households stored water. At the point of delivery, therefore, water access crossed over from a service provided by a formal network to a service created through what the literature calls a 'coping mechanism'. Although in many cases formal services did enter the home by way of a private tap, until KUWASIP began its 24/7 pilot those services did not include the reliability of water.

Our household survey shows that, with 24/7, the quantity, convenience and reliability of water supplies have measurably improved. The quality of water at the tap has also improved (Kumpel and Nelson, 2013). But the vast majority of our survey respondents in the pilot zones – over 90% – continued to collect and store water almost two years after the upgrade to continuous water service. On average, they spent just over 7 hours per month collecting this water; we observed that households collected and stored their drinking and cooking water on average once every 1.5 days. Our research team measured stored volumes in a systematic sample (n = 350) of the households surveyed in the 24/7 zone. The volumes of actively used storage capacity varied tremendously. The median total volume stored was over 100 liters. Discounting the water stored in overhead and underground tanks, the median volume in containers was still above 50 liters per household (see Table 2.2).

Table 2.2: Storage volume in regular use; 24/7 water supply zone, Hubli-Dharwad.

	Total (liters)	Overhead and underground tanks (liters)	Smaller containers (liters)
Mean storage volume	425	968	203
Median storage volume	133	667	74
n =	350	80	350

The continuation of storage within a continuous pressure supply zone surprised us; storage is supposed to fill a 'gap' in an intermittent or unreliable water supply mechanism. In-home storage also increases the risk of re-contamination in the home (T. Clasen and Bastable 2003), a problem that continuous water supply seeks to overcome. We initially hypothesized that KUWASIP's implementation was imperfect, and that the allegedly 24/7 zones were, in fact, not so. But our interviews of customers did not bear this out. That they invested any time at all in collecting water was itself an indication that they valued stored water. Those who continued to store produced a range of reasons, including "it is a habit"; "this is how we use water"; and "it is a back-up, just in case". Discussions with household members revealed that people have grown accustomed to collecting and storing water. Those with rooftop tanks saw no reason to change their overhead storage practices; they had, in effect, provided themselves with 24/7 water. Those with buckets and pots suggested that as long as water is delivered punctually every day, or even every other day, they do not mind storing. In effect, these consumers choose this informal practice over the formal alternative.

In addition to user habits, we posit that user convenience is also a partial explanation for continued storage practices. In the course of our many household visits, we observed that the household tap is most often not inside the kitchen, but just outside the home or a few feet away from the home. Even a very short walk to water, no more than a few seconds long, was inconvenient relative to storage vessels in the kitchen. Behavioral economists have argued for some years that "small hassle factors" (Bertrand, Mullainathan, and Shafir 2006: 16) routinely dissuade people from program take-up, and that economists often consider these factors to be "too minor to be taken seriously" (ibid: 16). Storing in the home is itself a hassle, but the World Bank and KUWASIP, in arguing that "24/7 supply converts household coping costs into resources for the service provider"(Franceys and Jalakam 2010: 4), may not have foreseen that stepping outside the front door for water could be seen as an even bigger hassle by a majority of its customers. What our respondents cared about was that the water be delivered on time so they did not have to wait, and to have water right at the point of use so they did not have to walk.

Finally, the image of an incompetent utility was still vivid in people's minds. Several respondents told the lead author that they stored because they feared that one day they would turn on the tap and no water would come out. When pushed to recall an incident of tap failure, they readily admitted that the 24/7 tap had never, in fact, failed to yield water. They agreed that they could not complain about water deliveries in the two years since KUWASIP began operations, but those years had not eclipsed their memory of decades of intermittent water supply.

We conclude that the informal provision, not of access but of convenient and reliable access, within an otherwise formalized (and, by all accounts, smoothly functioning) water network persists for three reasons: the utility has yet to build up enough trust between itself and its customers; consumers are habituated to storing water and, at least for now, are not motivated to change; and the utility failed to see 'convenience' through its users' eyes, implicitly assuming that a continuously yielding outside tap was less of a hassle than an intermittent tap with storage containers in the kitchen. We thus find that formal and informal processes coexist, not only just across spatially differentiated delivery mechanisms but also within a single water delivery mechanism. In this sense, Bakker's archipelago is extended into the home: it reaches between the pipe and the storage vessel and climbs into the upper reaches of the roof tank.

The continuation of non-payment

KUWASIP has, in the main, eliminated illicit connections within the demonstration zones, metered all connections, billed water users for 83% of all water produced and issued charges for 96% of all water supplied (World Bank 2011: 33). KUWASIP had set an objective of billing

70% of all water produced; its performance represents an instance where the pre-project objectives were met and exceeded. But not all those receiving bills are paying them, and issuing charges is not the same as collecting them. Although Gulbarga 'decoupled' old arrears and started their KUWASIP tariff collections by zeroing out all past due amounts, Hubli-Dharwad has chosen to carry old arrears forward. According to an article in the Times of India (2012), as of May 2012, more than 1500 households in Hubli-Dharwad have received bills for arrears of Rs15,000 – Rs20,000 each (US$273-455) (The Times of India 2012b). Such large amounts owed in arrears could only have been accrued over a period of several years.

Our survey in the 24/7 zones confirmed the Times of India report that many households owed the utility significant sums of money. Of the 1986 households that completed the survey, 86% reported receiving a water bill in the past month and 59% of them showed us their bills. Of the bills we were allowed to see, the median arrears amount was Rs213 (US$3.74), about equivalent to the average monthly bill. But 34% had arrears above Rs1000 (US$18) and 5% owed over Rs10,000 (US$180). We labelled arrears that had accumulated over a period of six months or more as 'large'. The households who owed more than six months' worth of arrears came from all income groups, but low-income households dominated. Since reported income is notoriously unreliable, and the variation for this parameter in our survey data was large, following Ercumen (2013), we also categorized our respondents by wealth. In households that showed us their bill and owed less than six months in arrears (n = 618), the average per capita monthly reported income was Rs1621, while in households that owed more than six months in arrears (n = 373) this amount dropped to Rs1091. Likewise, asset ownership is markedly different across these two groups: those with low arrears were significantly more likely to own tables (which require dedicated floor space and thus indicate a minimum floor size), refrigerators, and motorcycles as compared to the households with high arrears. Table 2.3 shows that large amounts of arrears occurred disproportionately in households with below median wealth.

Table 2.3: Number of households with large arrears (24/7 areas only).

	Number of observed water bills		Reported Income per capita	
	Below median wealth	Above median wealth	Median	Mean
Arrears < 6 months of charges	849	1191	1000	1621
Arrears > 6 months of charges	724	524	755	1091

We found that many households were happy with the continuous water service and willing to pay the increased rates that prevailed in the 24/7 zones. But we also found that a sizeable minority of households were not, in fact, paying, and were instead accruing rather large arrears. We suggest that non-payment for the recently regularized connections represents the "quiet encroachment of the ordinary" (Bayat, 2000: 545), whereby ordinary urban dwellers seek access to water and other resources through informal means. We argue that non-payment can be explained not only as resistance to higher tariffs, and as an (implicit) assertion of the right to water, but also by the unwillingness to let go of informal storage.

Our data may underestimate the actual numbers who owed money because 40% of our respondents refused to show us their water bills. Many lower-income household members said that 24/7 was a clear benefit over water that arrived once every few days, but that the high water tariffs were burdensome. When the monthly bill went from Rs90 to over Rs300, it was too much, said one respondent by way of explanation. She did not need 24/7 water at that high price, she argued; water for 4 hours every other day and at a lower cost was fine for her family's needs. She did not want a tap that would yield water even at midnight because why would anyone wish to turn on the tap at midnight? In effect, she argued, she was 'stuck' with 24/7, unable to control children and non-earning family members from running the tap for trivial reasons and wasting water, for which she, one of only two members earning an income, was then forced to pay the bill.

Such narratives, in effect a form of justification for being unwilling to pay, are completely consistent with Bayat's analysis of quiet encroachment within a formal service system. They are also consistent with our previous observation that many 24/7 customers are willing to self-provide convenience, at least up to a point. While KUWASIP is focused on continuous access, citing quantity, quality, reliability and convenience, some their customers value the frequency and reliability of delivery over quality and continuousness per se. If, for reasons of habit or trust or convenience or some combination of these, households plan to store water anyway, they would understandably not wish to pay the full charge for 24/7 service. The World Bank's Project Appraisal Document (World Bank, 2004: 50), arguing for the benefits of continuous service to consumers, says: "[a]ssuming that coping costs to supplement water needs will be *fully offset* by the introduction of 24/7 service, the NPV[2] would be Rs25.7 million and the IRR 14%" (emphasis added). But we find that consumers may not value fully offsetting their 'coping costs'.

On April 30 2012 KUWSSB declared that it would start to shut off connections for accounts in Hubli that owed excessive arrears (WebIndia123 2012; The Times of India 2012a). In response, as Bayat would have predicted, a massive protest in Dharwad was held on May 14 2012 (The Times of India 2012a). Despite connections having been formalized, or more accurately, perhaps, because of it, the quiet encroachment of the individual suddenly needed to be collectively defended. While many water users who previously had illicit connections were now paying customers, well integrated into an upgraded water distribution system, and other previously informal users simply became non-paying customers within the demonstration zones. As long as the formal system did not distinguish between an illicit water user and a non-paying customer, there was no need for insurgency. But the threat of losing water access or having to pay substantial sums of money to the utility moved many to noisy action. We find that the quiet encroachment of the past continues in this regime of increased formalization, despite streamlined metering, billing and payment options, and that public outcry remains a constant threat.

The negotiation about what to do with customers who have large outstanding arrears is still ongoing. If non-paying customers remain connected to the system, the utility may not be able to recover its operating costs, and currently paying customers may be tempted to stop paying. But, given the polarization caused by private sector participation in the 24/7 project, KUWSSB

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[2] NPV stands for net present value.

cannot simply cut people off without political fallout. These households would now be worse off than they were before KUWASIP came, given that free public water access has been all but eliminated.

Bayat (2000: 549) notes that the poor may make efforts to stay outside of the formal network simply because formalization can require them to conform to more rigid requirements:

> *…modernity is a costly affair (…) it requires the capacity to conform to the types of behavior and mode of life (adherence to the strict disciplines of time, space, contracts and so on) which most vulnerable people simply cannot afford. (…) In their quest for security, the poor then are in constant negotiation and vacillation between autonomy and integration.*

Our work in Hubli-Dharwad does not suggest that the poor are deliberately trying to stay outside of the formal water system. We find that many would prefer to conform to a mode of life in which water supplies are regular, predictable and 'modern'. No respondent in the 24/7 zone preferred the autonomy of fetching water from a public bore well to the integration of a municipal tap in the yard. But 24/7, with both its predictability and higher tariffs, has fragmented its customers, low-income or otherwise. Some respondents told us that having 24/7 water is like an addiction and that they can no longer go without its convenience. Those were not among the non-payers in our survey. But the specific mode of formalization has made the 'last mile' provision of reliability, convenience and affordability an in-house step for others – reliability and convenience through continued storage, and affordability through quiet encroachment punctuated by mass protest when the right to affordable water is under threat.

2.4 Conclusions

This study has used observations made in intermittent areas in order to describe the extent of informality which existed before KUWASIP was implemented. We have presented observations made in 24/7 areas in order to illustrate the existence of two specific practices, storage and non-payment, in an otherwise formalized system. We cannot say exactly why storage and non-payment have continued, although we put forward some possibilities based on our interviews and surveys.

The formalization process in Hubli-Dharwad during KUWASIP's 24/7 implementation improved water quantity, water quality, and reliability for the consumer, and the balance sheet for the utility – all positive outcomes in this case. As predicted by the World Bank and KUWASIP, many consumers have been willing to pay higher water charges to be freed from the drudgery of waiting for and collecting water. But the 24/7 effort has not accomplished the degree of formalization envisioned at the start. Home-storing is still a widespread practice and quiet encroachment continues through non-payment of bills. Storing water and accessing water without paying are classical forms of urban informality. We argue that the persistence of these informal forms of water access suggests that

1. convenience is defined by the experience of the water user; understanding that household-level infrastructure may lead to 'small hassles' is a key part of the project's cost-benefit analysis;
2. water users place a high value on convenience and affordability relative to other dimensions of water service such as water quality or continuous availability; and

3. developing trust between water users and providers is necessary, although perhaps not sufficient, for the reduction of 'overlapping strategies' and, relatedly, of non-payment.

We find that storage in Hubli-Dharwad continues for the same reasons it always did: to create reliability and convenience. The persistence of storage within a formal, well-performing water delivery system shows that industrialised and corporatized water (cf. Bakker, 2003) need not supplant informal processes. We find that non-payment continues for the same reasons it always did: lower-income customers find it difficult to pay, especially when in default, and stealthily protect their access to water. Additionally, if people are going to store water anyway, they may not value, and thus not wish to pay for, all the features of 24/7 delivery.

We conclude that there may be limits to the extent of formalization – i.e. there may be some 'slack' for a considerable period of time – in a city transitioning from intermittent to continuous water supply. These limits depend on consumer habits, consumer values, the history of a city's water supply and accidents of infrastructure. Two years from the launch of 24/7 water supply, informal methods for creating convenient access persist, and many non-paying customers remain in Hubli-Dharwad. Despite formalization, capital upgrades, the introduction of international actors, and the aspiration to international standards, many residents are quietly accessing water outside formal channels.

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3 Continuous Piped Water or Improved Intermittency? Willingness to Pay for Improved Piped Water Services in Hubli-Dharwad, India[3]

Abstract

Intermittent water service (IWS) is the norm in many piped water systems in Asia, Latin America and Africa. Compared to continuous water service (CWS), IWS degrades water quality and imposes 'coping costs' on households who must spend time and money waiting for, collecting, storing and treating their water. An understanding of households' willingness to pay (WTP) for improvements in frequency, duration and punctuality of IWS, or comparisons of WTP for improved IWS over CWS, remain absent from the literature. Using stated preference data, this study estimates a discrete choice model of WTP for improvements in piped water services in Hubli-Dharwad, India. We find a positive WTP for incremental increases in the frequency, duration, and punctuality of IWS deliveries. Among below median wealth (BMW) households, the estimated WTP for increased frequency and duration of IWS deliveries ranged from ₹37 - ₹106 (US$ 0.72 – US$ 2.09) per month, while the estimated WTP for punctuality ranged from ₹18 - ₹30 (US$ 0.36 – US$ 0.60) per month. Households that have never experienced CWS prefer incremental improvements in IWS over an upgrade to CWS; the estimated WTP for CWS among BMW households located in IWS areas ranged from ₹23 - ₹38 (US$ 0.45 - US$ 0.75) per month. This is in stark contrast to BMW households that have experienced three years of CWS; they clearly prefer CWS, as their estimated WTP for CWS ranged from ₹115 – ₹191 (US$ 2.25 – US$ 3.74). For households in CWS areas, a negative WTP estimate for water quality may indicate that the taste and smell of higher chlorine concentrations compared to IWS areas, is a

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[3] Co-authored with Mollie Van Gordon and Akshay Vij

salient, negative issue among households, even three years after CWS began. The removal of public borewells in CWS areas is shown to have negatively impacted some low-income households. Our WTP estimates indicate that incremental improvements in IWS should be considered by water utilities that are not considering an improvement to CWS, and that in some cases improved IWS may be preferred over an upgrade to CWS.

Keywords

Willingness to pay, continuous water service, intermittent water service, water quality, borewell access, punctual service, piped water service

3.1 Background

Urban access to piped water is low in many regions of the world: 43% in Sub-Saharan Africa, 51% in South-Eastern Asia, 56% in Southern Asia (WHO/UNICEF 2015). Even for those who have piped water access, it is often available only intermittently; in 2000 the World Health Organization (WHO) estimated that over one third of the urban water systems in Africa and Latin America and over one half of the systems in Asia operated intermittently (WHO/UNICEF 2000). Not all IWS systems are created equal; service quality varies greatly by location, both between cities and within cities. Service quality can be seen to have many different dimensions: water quality; reliability of access; quantity of water available; and convenience at the point of use, for example.

IWS systems have decreased water quality compared with CWS systems, due to insufficient chlorine residual and intrusion of fecal contamination in the network (Kumpel and Nelson 2013; Lee and Schwab 2005). Although most cities in India report water availability of approximately four hours per day, many deliver water once every 5-10 days (WHO/UNICEF 2000; McKenzie and Ray 2009; NFHS 1998). Through the deterioration of water quality, limited availability or other inconveniences, IWS delivery imposes 'coping costs' on households, requiring the expenditure of time and money on water management activities within the household (Zérah 1998; Pattanayak et al. 2005). Even under CWS, Burt and Ray (2014) observed that the distance between the tap and the point of use may have perpetuated some coping behaviors, such as water storage in the home, although it is likely that coping costs were reduced with a conversion to CWS (Burt and Ray 2014).

We present here a study of WTP for incremental improvements in IWS water services, compared with WTP for CWS. Using a stated preference experiment, we found that households had a positive WTP for IWS deliveries that were more frequent, of longer duration or more punctual; in fact their WTP for improved IWS was sometimes larger than their WTP for CWS. We also found that improved water quality was valued. Yet water quality improvements which were due to increased chlorine concentrations also brought an unfavorable taste and smell that may have been a more salient negative aspect of water services than the water quality improvement. Although the majority of our participants did not value access to free, public, supplemental borewells, a subset of BMW households seems to depend on them. All of this implies that reducing coping costs may hold value for many households, but the true value of a water upgrade is complicated by the level of household wealth and their past and current experiences with water.

The Costs of Coping with IWS and the WTP for Improved Services

In Kathmadu, Pattanayak et al. observed that coping costs arise from five behaviors: collecting, pumping, treating, storing and purchasing water. In their study, 'collecting' included waiting for water to become available, collecting it at the source and then transporting it back home; this was primarily a time expenditure and according to their estimates represented approximately 45% of total coping costs, which were approximately US$3 per month, or 1% of total household income, on average. Furthermore they observed that coping costs vary with the socio-economic status (SES) of the household: households in the highest income quintile had coping costs which were four times the coping costs observed in households from the two lowest income quintiles, as expected based on income effects. Time expenditures as a proportion of total coping costs were much larger in low income households than in higher income households, which may have contributed to this difference (Pattanayak et al. 2005).

Zérah (2000) described six 'strategies' for coping with a lack of water supply reliability, including collecting, pumping, and storing, which were defined in the same way as Pattanayak, as well as 'adaptation', 'qualitative' and 'exit' strategies (Zérah 2000). The adaptation strategy included recycling water and rescheduling activities; the qualitative strategy included both water treatment within the household and complaining to the utility about water quality problems; and the exit strategy consisted of moving to a new house in a new location. Zérah (1998) estimated the 'costs of coping with unreliability' in Delhi, India, which included time and money spent collecting, pumping, storing, treating water and treatment/recovery for waterborne illnesses. Just the costs of collecting, pumping and storing were estimated to be ₹ 3 billion (US$ 81 million) per year for the city; the average household was estimated to spend ₹ 2000 (US$ 54) per year on coping costs, 5.5 times the cost of the average annual water bill at the time of the survey. This represented 15.7% of monthly income in low income households, and 1.4% in higher income households (Zérah 1998).

Therefore, in intermittent water service (IWS) areas, improved water services can have a positive economic impact on households, whether through savings in time, money or a combination of the two. In India alone, over 150 million people are served by intermittent systems, as no large metropolitan area has CWS (WHO/UNICEF 2000; McKenzie and Ray 2009; NFHS 1998). Where, whether and when to improve urban water services is a hotly debated public policy question in India; furthermore the types of improvements made and the costs incurred while making them has the potential to directly impact millions of households.

Depending on the system being upgraded, it often requires heavy upfront investment and a large increase in the operations and maintenance budgets of the managing water utility. Therefore it is not always clear whether and when the benefits of CWS outweigh the costs. How much water users are willing to pay and what constitutes 'affordable' water tariffs is an on-going policy debate (A. McPhail 1993; Sangameswaran, Madhav, and D'Rozario 2008; Hutton 2012).

Understanding which characteristics of the water system are the most important to the end-user is crucial when evaluating a piped water system. It is a mistake to group all IWS in one category and all CWS in another as both service types come in many different flavors. For example, increases in frequency, duration and punctuality of deliveries under IWS might decrease coping costs. At the same time, conversion to CWS might not eliminate the behaviors associated with coping costs, due to inconvenient access points, past experience with the utility and the continuation of established local practices (Burt and Ray 2014).

Water utilities must, in an on-going basis, make decisions regarding the balance between the quality and the affordability of their services, since improved services often increase the utility's production costs. Understanding the preferences of the local end-user, and how they shift over time, informs this decision making process. This requires that end-user preferences be well understood, both today as well as tomorrow. For example, under IWS, when some amount of rationing is occurring, consumption will increase if there is an increase in the number of hours per week that water is available (Andey and Kelkar 2009). In this case, improving the frequency and duration of deliveries requires that the utility increase their water supply. This can be done either through decreasing non-revenue water or increasing the water extracted from the source; both of these options are likely to have associated costs for the utility. Therefore in the absence of adequate subsidy, customer willingness to pay is likely to be a vital piece of information for the decision to increase water availability and access.

Whereas many studies have looked at the benefits of CWS, and made a theoretical comparison with IWS, we are not aware of any studies that have estimated the value for end-users of incremental improvements to IWS, and compared those to the value of CWS, within one urban conglomeration. WTP for improved water quality and borewell access has been estimated for some IWS systems, and some form of reliability has been estimated for CWS systems (Asthana 1997; Nam and Son 2005; Willis, Scarpa, and Acutt 2005; Hensher, Shore, and Train 2005; MacDonald et al. 2005; Snowball, Willis, and Jeurissen 2008). Echenique and Seshagiri (2009) estimated WTP for IWS with increased frequency and quantity (as well as pressure, seasonality and quality) in Hyderabad, but no previous study has estimated the value of increased frequency and duration of delivery, or an improvement in the punctuality of deliveries for IWS

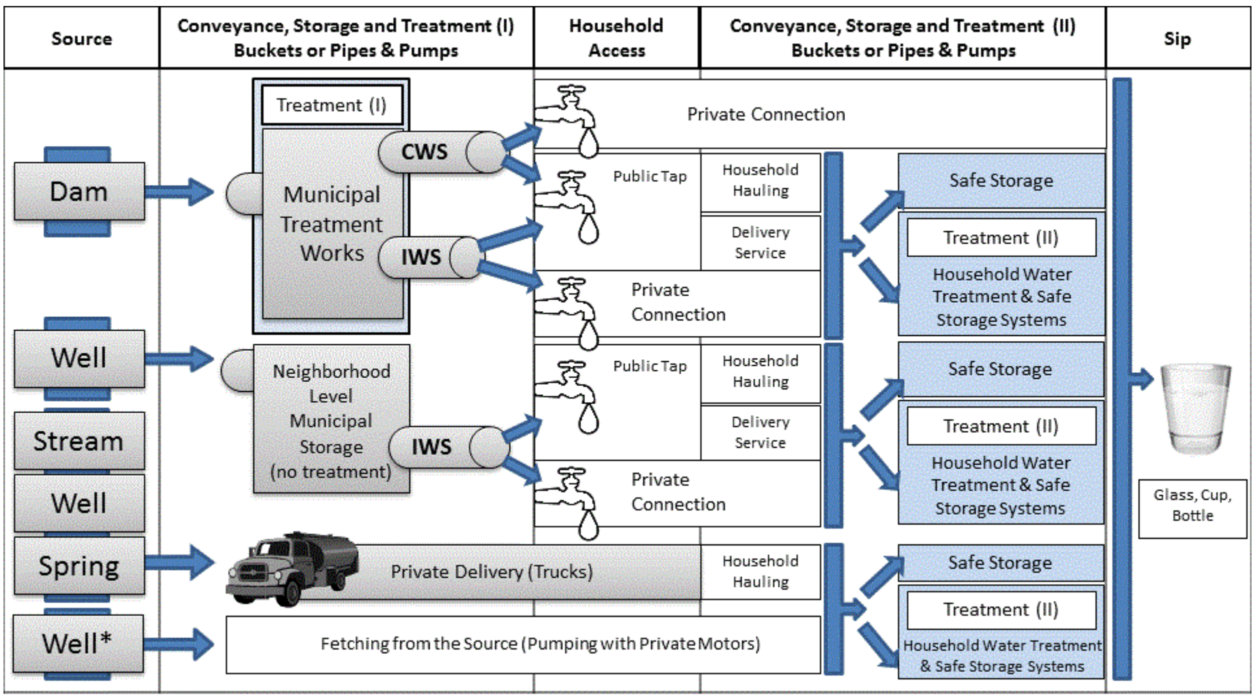
(Echenique and Seshagiri 2009). In this paper, we estimate WTP for these three aspects of water service and compare them with WTP estimates for CWS, as well as for water quality improvements and supplemental borewell access.

Understanding which dimensions of IWS service quality were more highly prized is an essential step in characterizing end-user value. Not accounting for these aspects explicitly when comparing IWS with CWS could undervalue potential improvements to IWS. In addition, we looked at the effect of experiencing CWS on the WTP for CWS. Our results will allow water system operators to consider the full range of upgrade options for IWS (including CWS), and present a more accurate comparison of the value of IWS versus CWS.

Local Context: Water Services in Hubli-Dharwad, India

Hubli-Dharwad is a mid-sized city, situated in the state of Karnataka, India. It has a population of 943,185, making it the second largest city in Karnataka, after Bangalore (Census of India 2011). The majority of households receive IWS, although roughly 10% had received CWS for three years at the start of the study period. The five categories of coping behaviors observed by Pattanayak in Kathmandu (collecting, pumping, treating, storing and purchasing water) are common in IWS zones of Hubli-Dharwad, and present to a lesser degree in CWS areas (Burt and Ray 2014). Using the S2S framework described by Amrose et al. (2015), Figure 3.1 provides a graphical representation of the water system in Hubli-Dharwad. Coping behaviors in the form of hauling, delivery and waiting were categorized as part of "collecting" by Pattanayak, but are separated in the S2S framework. As can be seen from the figure, CWS with a private connection has less need of coping behaviors, as less work is necessitated on the part of household members, and there is less chance of contamination, both in the distribution system and within the household.

Figure 3.1: The Source to Sip (S2S) Water System in Hubli-Dharwad (based on a framework presented in Amrose et al. 2015). Continuous Water Service (CWS) and Intermittent Water Service (IWS) are both present in different parts of the piped water network. Treatment (I) is the filtration and chlorination performed by the utility at the municipal treatment plant, while Treatment (II) consists of treatment (where it may exist) performed within the households themselves.



** Some higher income households owned private borewells. These were the only instances of households accessing water at the source; in these cases water transport was accomplished through pipes and motorized pumps.*

For IWS households in our study sample, delivery frequency did not vary across wealth categories, but it did vary across data collection rounds. We attribute most of this improvement over time to investments made in the IWS network by the utility during the study period, although some of it may have been seasonal. 83.8% of households received water once in 5 days or more during round 1, while 87.3% of households received water once in 3 days or less during round 4 (see Figure 3.1). Water access and storage did vary by wealth category, but did not vary significantly across data collection rounds. We grouped households into three categories of access and storage, based on water usage types described by Woelfle-Erskine (Woelfle-Erskine 2012); 1) households that access water through a shared public standpipe, 2) households that have a private tap on their premises but no overhead storage, and 3) households that have both a private tap and overhead storage on their premises. We found that above medium wealth households were much more likely to have access to a private tap and an overhead storage tank and less likely to use shared standpipes to access their water (see Table 3.2. Source: Burt and Ray 2014). Burt and Ray (2014) report a higher likelihood of accessing an unauthorized connection in below medium wealth households (Burt and Ray 2014). Supplementary to the piped water supply, as of 2008, there were an estimated 545 electric and 1035 handpump borewells throughout Hubli-Dharwad (Wilbur Smith Associates Pvt. Ltd. 2003).

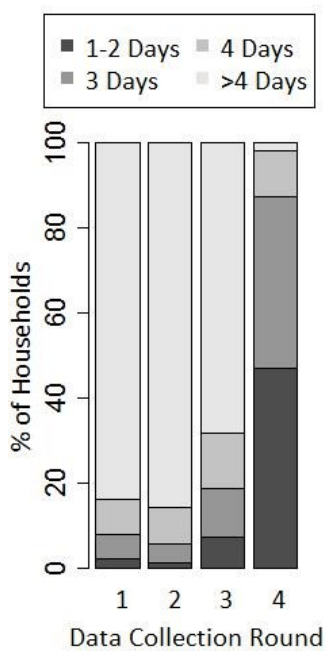


Figure 3.1: Water delivery frequency across data collection rounds. The reported delivery frequency of participating households in IWS zones during the study period

Table 3.2: Water access type by percentage of population and wealth category, Hubli-Dharwad (IWS Zones). (Source: Burt and Ray 2014)

	Shared standpipe	Private tap	Private tap with overhead tank	All access types
BMW	9.8%	82.1%	8.1%	100%
AMW	2.9%	37.6%	59.6%	100%

Hubli-Dharwad is not an uncommon case in urban India. Most urban water utilities in India are government controlled; water tariffs are extremely low, and the utility budgets are heavily subsidized by the government. This model of service provision focuses on keeping tariffs low in order to make certain that rates are affordable for all households. At the same time, due to budget limitations, network expansion is slow, leakage rates are high, IWS is the norm and access is limited for many low income neighborhoods, resulting in the near universal adoption of various coping behaviors. Water users in many locations have become used to low quality water service, even though it often results in high coping costs (Franceys and Jalakam 2010).

In order to address this problem, and using Hubli-Dharwad as an example, the World Bank (WB) partially financed a pilot project, the Karnataka Urban Water and Sanitation Improvement Project (KUWASIP). One of the goals of KUWASIP was to provide CWS to 10% of three mid-sized cities in northern Karnataka, one of which was Hubli-Dharwad. The total cost of KUWASIP was US$ 52 million; US$ 47 million was used to implement the CWS demonstration projects in the three pilot cities (World Bank 2004). Out of a total of 69 wards within Hubli-Dharwad, 8 wards were chosen to be included in the demonstration project based on ease of hydraulic isolation within the piped water network. These wards cover a mix of low, middle and high income households, similar in proportion to the rest of Hubli-Dharwad (Sangameswaran, Madhav, and D'Rozario 2008). In addition to upgrading from infrequent IWS all the way to full CWS all free public standpipes were removed and nearly all free public borewells were shut down. All connections were registered with the local utility and put on an increasing block rate tariff structure, resulting in an increase in the average monthly bill. The CWS and intermittent tariff structures are compared in Table 3.2.

Table 3.2: Comparison of the CWS and Intermittent Tariff Structures

	CWS		**IWS**	
Flat Rate	₹48		₹90*	
Meter Charge	₹30/month		(none)	
	Volume (kL)	*Tariff (₹/kL)*	*Volume (kL)*	*Tariff (₹/kL)*
Volumetric Rate	8-15 15-25 >25	10 15 20	>15	5.8

**Some houses which were not metered were charged ₹180 (2 x ₹90) if they were likely to be using more than 15 kL/month.*

The paper is organized as follows: section 2 reviews the methods, including the methods used for data collection, the experimental design used to elicit end-user preferences and the econometric framework employed by the study to obtain WTP estimates; section 3 discusses the estimated model and WTP results; section 4 forwards policy recommendations based on our findings; and lastly, section 5 concludes the paper with a summary of findings, contributions and recommendations for future research.

3.2 Methods

The stated preference data presented here was collected as part of a larger study evaluating the effect of the CWS demonstration project, including health, water quality and household economic impacts (Kumpel and Nelson 2013; Ercumen 2013; Burt and Ray 2014). Evaluations of the case of Hubli-Dharwad presented our research team a unique opportunity; it allowed us to estimate the impact of the CWS demonstration project through direct comparison of matched case-control clusters from within the same city, crucial to the larger impact study. Particularly for this paper, the case-control comparison allowed us to estimate the impact of experience with CWS on WTP. In addition, the conversion to CWS has been somewhat controversial, sparking public protest in Hubli-Dharwad, and public debate elsewhere in Karnataka (Sangameswaran, Madhav, and D'Rozario 2008). Therefore we embarked upon a stated preference study as part of the larger impact study in order to estimate the value of water services in Hubli-Dharwad, in an attempt to bring more transparency and contribute useful information to this debate.

Data Collection

Household-level impacts were investigated using a quasi-experimental approach called genetic matching to allow unbiased comparison of intermittent and continuous zones of Hubli-Dharwad (Sekhon and Grieve 2008). In order to control for covariates, 8 control wards were chosen from the 61 remaining IWS wards. The control wards were chosen as pair-wise matches for the intervention wards based on a 15,000 household survey conducted by CMDR in 2006 (before the CWS intervention began) (CMDR 2006). They were matched based on ward-level economic indicators (proportion of slum households, low-income households, quality of material used to construct the house, houses with one room), demographic indicators (proportion of illiterate females), water and sanitation conditions (presence of household tap and latrine, garbage disposal and collection, pre-CWS water delivery frequency) and health indicators (pre-intervention monthly health expenditures).

Each selected control ward and all of the intervention wards were visually inspected by the research team to provide a qualitative check for comparability between CWS and selected IWS wards in terms of observable characteristics that served as a proxy for wealth status, such as construction materials used in habitations and the number of roof tanks present in the neighborhood. The wards were then split into clusters, i.e. zones within the ward that display homogeneous economic and demographic make-up (determined qualitatively by visual inspection) and separated from other zones in the ward through roads, field or other natural barriers. 250 participants were enrolled from each ward, where the number of participants to enroll from each cluster was determined qualitatively based on the population density of the cluster to obtain a representative sample of the ward. Participants were selected by identifying a random starting point in each cluster (often a landmark such as temple or intersection) and enrolling each household that met the eligibility criterion of having a child under the age of five until the desired number of participants was enrolled in each cluster.

Four rounds of surveying were conducted over the course of 16 months (November 2010 – February 2012). The survey instrument was extensively piloted in order to ensure that it reflected the specific ways in which people interacted with water in Hubli-Dharwad. It included questions which focused on expenditure of time and money for collecting, storing, and treating water, as well as the time and money associated with the use of alternative sources, or resulting as a consequence of waterborne illness. Socio-economic information was collected on all households during the first two rounds of data collection. In order to estimate household wealth, a relative wealth score was estimated outside of the choice model using a principal component analysis of household assets, and all participants were then categorized based on their score as either AMW or BMW.

Revealed preference information is unfortunately not available in Hubli-Dharwad due to data limitations; the majority of households outside of the pilot areas don't have water meters, and of those, many are accessing their water through public standpipes or illicit connections (Burt and Ray 2014). Furthermore, households with water meters in IWS are typically upper income; any demand model built on this consumption data would not be representative of the larger urban population. Therefore, stated preference information was collected in order to estimate willingness to pay for improved water services. Survey data was collected from 3,305 households during round four, half in the CWS zone and half in the intermittent zones. All of these houses were invited to participate in the stated preference portion of the survey.

We trained our research team to conduct the survey using the Open Data Kit (ODK) software, run on Android phones (Hartung et al. 2010). The individual forms were downloaded onto a single designated computer at the end of each day of fieldwork, and aggregated into a single csv database using the ODK Aggregate software. We performed data checks on the aggregated data on a daily basis. Once data collection was completed, analysis and the production of data tables and figures were done using R (R Core Team 2012). Maps were produced using ArcGIS (ESRI 2011).

Ethics

Participants were briefed as to the details of the study and given the opportunity to ask questions and receive answers to those questions. Enumerators obtained informed verbal consent from each respondent prior to inclusion in the study. Our research protocol was approved for ethical compliance by both the University of California at Berkeley's Office for the Protection of Human Subjects and the Center for Multi-Disciplinary Research, Dharwad, India.

Stated Preference Experiment Design

We constructed the stated preference survey instrument according to guidelines set out by Train, Gunatilake et al. and Whittington (Train 2009); Gunatilake et al. 2007; Whittington 1998). We limited the number of attributes included in the choice sets to five, in accordance with Miller's finding that the average person is able to receive, process and remember between 5-9 new pieces of information at one time (Miller 1956; Saaty and Ozdemir 2003). In order to select the five characteristics most important to local water users, a pilot of 12 characteristics of water service delivery were presented to households residing outside study areas, in an interactive interview format, in order to judge which attributes they valued most highly. From this list we chose five characteristics for inclusion in our study, along with price (see Table 3.3).

We chose choice-sets randomly, and assigned them to participants by household identification number before going to the field. The enumerators received a list of household identification numbers and the assigned choice-sets, and presented cards displaying those sets for the participant's reference during this portion of the survey. Each respondent was given three choice-sets, each containing two alternatives, and asked to choose their favored option from each pair. The total number of participants included in the final dataset was 2832, with 8480 associated choice-sets. The enumerators recorded the choices-sets presented, and the associated prices, estimated bills and favored option for every choice set.

In addition, in order to increase the respondents' understanding and contextualize the prices given, before being presented with a two-alternative choice-set, they were given an estimate of what their monthly water bill would be assuming the standard volumetric prices presented in their choice-sets. The PDAs used by our research team were programed to calculate this bill estimate, using a water usage estimate. The water usage estimate used the consumption listed on their most recent water bill, if available (n = 950). If a bill was not available, and the household was in an IWS area, then an estimation of their current storage capacity was used, including all small containers, barrels and larger storage tanks (n = 1041). If the bill was not available, and the household was in a CWS area, then their usage was estimated by asking how many 'mutkas' they used per day, on average, and multiplying this amount by 31 days (n = 841).[4] The water usage estimates which were not based on observed bills were conservative; they tended to be a fraction of the volumes observed in water bills. The same estimated water usage was used across all choice-sets presented to a given household. After multiplying the estimated water usage by the volumetric price of the choice-set option, an additional ₹ 30 was added before presenting the total as the estimated water bill. This was done in order to incorporate a fixed charge; ₹ 30 is the same fixed charge which is currently part of the tariff structure in CWS areas of Hubli-Dharwad.

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[4] A mutka is a local water storage container; the most common size holds 10 liters of water.

Table 3.3: Attributes and levels included in the stated preference survey. Attributes are listed in order of descending utility. Prices were given in the choice set as ₹ per 10 liters (the most common volume for a mutka, a traditional local water container), along with an estimated bill.

Prices (₹ per kiloliter)	
	₹ 1, ₹ 10, ₹ 15, ₹ 25, ₹ 50, ₹ 100
Frequency + Duration	
	You receive water 24 hours per day, 7 days per week.
	You receive water for 5 hours every 2 days.
	You receive water for 2 hours every 2 days.
	You receive water for 5 hours every 5 days.
	You receive water for 2 hours every 5 days.
Punctuality of Delivery	
	Your water is always delivered exactly on time (*omitted if CWS included in choice set).*
	Your water is 3-5 hours late, twice per month.
Borewell Access	
	There is a functioning public borewell near your home. If you don't have one now, then a public borewell is installed starting tomorrow.
	There is no functioning public borewell near your home. If a public borewell is there, then it is permanently closed starting tomorrow.
Water Quality	
	For Households in CWS Areas:
	Your water quality is the same as it was before CWS water began.
	Your water quality is the same as you are currently receiving.
	For Households in IWS Areas:
	Your water quality is the same as you are currently receiving.
	Your water quality is better than the water you are currently receiving.

Econometric Framework

Discrete choice models have been used to model consumer preferences across multiple disciplines, such as transportation (Train 1980) and environmental services (Boxall et al. 1996; (Adamowicz et al. 1998) among others. Within the context of water utility services, multinomial, nested and mixed logit specifications have been used, and many studies have looked at WTP for improved water quality, borewell access or some form of reliability in addition to many other attributes (Asthana 1997; Nam and Son 2005; Willis, Scarpa, and Acutt 2005; Hensher, Shore, and Train 2005; MacDonald et al. 2005; Snowball, Willis, and Jeurissen 2008)**.**

We employ a mixed logit specification to model the choices of the subjects and infer how they value different attributes relative to each other. Mixed logit models are continuous mixture multinomial logit models that can approximate any random utility maximization model (McFadden and Train 2000). They allow for random taste heterogeneity, unrestricted substitution patterns and a rich error correlation structure. For a mixed logit model with a linear-in-parameters model specification, the utility of alternative j over choice-set t as perceived by individual n, denoted u_{ntj}, is given as follows:

$$u_{ntj} = \boldsymbol{\beta}'\mathbf{x}_{\mathbf{ntj}} + \varepsilon_{ntj} \tag{1}$$

, where $\mathbf{x}_{\mathbf{ntj}}$ is a column vector of explanatory variables, such as the attributes of the alternative and the characteristics of the individual; $\boldsymbol{\beta}$ is a column vector of taste parameters, with probability density given by $f(\boldsymbol{\beta})$; and ε_{ntj} is the stochastic component of the utility, denoting that which is unobserved by the analyst or purely random, assumed to be i.i.d. Gumbel with location zero and scale one across alternatives, choice-sets and individuals. Let y_{ntj} denote the choice indicator, equal to one if individual n chooses alternative j over choice-set t, and zero otherwise. Under these assumptions, and assuming further that individuals are utility maximizing, the probability that individual n chooses a sequence of choices $\mathbf{y_n} = \langle y_{n11}, \dots, y_{nTJ} \rangle$, where T denotes the number of choice-sets faced by a single individual (equal to three in our case) and J denotes the number of alternative in any one choice-set (equal to two in our case), may be given as follows:

$$f_y(\mathbf{y_n}) = \int_{\boldsymbol{\beta}} \prod_{t=1}^{T} \prod_{j=1}^{J} \left[\frac{\exp(\boldsymbol{\beta}' \mathbf{x_{ntj}})}{\sum_{j'=1}^{J} \exp(\boldsymbol{\beta}' \mathbf{x_{ntj'}})} \right]^{y_{ntj}} f(\boldsymbol{\beta}) d\boldsymbol{\beta} \tag{2}$$

The unknown model parameters are the distributional parameters associated with $f(\boldsymbol{\beta})$, and these are estimated via maximum simulated likelihood estimation using the free discrete choice estimation software Biogeme (Bierlaire 2003). For more information on the specification and estimation of mixed logit models, the reader is referred to see Train (2009).

Once the model parameters have been estimated, the appropriate WTP measure for any attribute can be calculated as the marginal rate of substitution (MRS) between that attribute and volumetric tariff (measured in rupees per kiloliter). The MRS represents the rate at which an individual is willing to trade off one attribute in exchange for the other while maintaining the same level of utility. Therefore, the MRS between any attribute and volumetric tariff denotes the WTP, in rupees per kiloliter, for a unit change in that attribute.

Mathematically, for a linear-in-parameters model specification such as the one assumed by equation (1), the marginal rate of substitution between any pair of attributes can be calculated as the ratio of the associated model parameters. In our case, the utility specification given by equation (1) may be expanded as:

$$u_{ntj} = \sum_{k=1}^{K} \beta_k x_{ntjk} + (\beta_{c1} z_{n1} + \beta_{c2} z_{n2} + \beta_{c3} z_{n3}) c_{ntj} + \varepsilon_{ntj} \tag{3}$$

where β_k and x_{ntjk} denote the k^{th} elements of the vectors $\boldsymbol{\beta}$ and $\mathbf{x_{ntj}}$, respectively; z_{n1} denotes the monthly water usage estimate, in kiloliters, for individual n; z_{n2} is a binary variable equal to one if individual n's income is above the median population wealth, and zero otherwise; $z_{n3} = 1 - z_{n2}$; and c_{ntj} denotes volumetric tariff, in rupees per kiloliter. Therefore, the willingness to pay of individual n for a unit change in the k^{th} attribute is given by:

$$WTP_k = \frac{\frac{\partial u_{ntj}}{\partial x_{ntjk}}}{\frac{\partial u_{ntj}}{\partial c_{ntj}}} = \frac{\beta_k}{\beta_{c1} z_{n1} + \beta_{c2} z_{n2} + \beta_{c3} z_{n3}} \tag{4}$$

By interacting volumetric tariff with variables denoting household income and monthly consumption, we allow the willingness to pay to vary across individuals in the sample population as a function of these two variables, as one would expect. A number of different functional forms were tried for denoting sensitivity to volumetric tariffs, and the form given by equation (3) proved the most satisfying in terms of both goodness of fit and behavioral interpretation.

In cases where any of the model parameters in equation (4) are specified as random variables with distributional parameters, WTP_k is a random variable itself with a distribution that can be calculated using equation (4). Note that WTP_k, as given by equation (4), is a measure of how much more individual n is willing to pay per kiloliter of water for a unit change in the k^{th} attribute. To obtain the monthly willingness to pay for the same change, one can multiply WTP_k by the monthly water usage estimate, given by z_{n1}, and it is this measure that we will be examining in subsequent sections.

3.3 Estimation Results

We estimated multiple model specifications, compared them across different measures of goodness of fit and the attendant behavioral interpretation, and here we present results from the model that we thought the best in terms of the two criteria, shown in Table 3.4. As described in Methods (Section 2 of this chapter), each of the hypothetical water services presented to survey respondents was characterized broadly in terms of frequency, duration and punctuality of water delivery, water quality, supplemental water supply, and the tariff structure. Systematic taste heterogeneity was captured by interacting each of the attributes of the water service with different characteristics of the individual, namely household wealth category and current water services.

Table 3.4: The stated preference discrete choice model.

Category	Variable	Estimate	P-value
Punctuality	Water delivered exactly on time		
	Below Median Wealth	0.087	0.13
	Above Median Wealth	0.151	<0.01
Water quality	Improve water quality if household in IWS wards	0.115	0.01
	Maintain water quality if household in CWS wards	-0.141	<0.01
Frequency and duration	24 hours per day, 7 days per week		
	Household in IWS ward	0.11	0.17

	Household in CWS ward	0.545	<0.01
	5 hours delivered once every 5 days	0.175	<0.01
	2 hours delivered once every 2 days	0.186	<0.01
	5 hours delivered once every 2 days	0.304	<0.01
Supplemental water supply	Supplemental borewell access		
	Below Median Wealth		
	Normal – Mean	-0.0755	0.27
	Normal - Standard deviation	1.08	<0.01
	Above Median Wealth	-0.00777	0.87
Cost	Tariff (Rs. per Kiloliter)		
	Below median wealth	-0.0177	<0.01
	Above median wealth	-0.00859	<0.01
	Estimated kiloliters used per month/100	-0.0329	<0.01
Summary Statistics			
Sample size: 8824 observations from 2832 individuals			
Log-likelihood: -5672.521			
Adjusted rho bar: 0.07			

Households situated in wards with access to CWS were treated differently from households situated in wards with access only to IWS. Random taste heterogeneity was captured by allowing taste parameters to be randomly distributed across individuals in the sample population. In the end, random taste parameters corresponding to only one of the model parameters – supplemental borewell access for BMW households - was found to be significant, implying that much of the heterogeneity in decision-making is captured adequately by the observable variables already included in the model specification. Most parameters have expected signs, and relative magnitudes are consistent with prior expectations and, wherever applicable, findings from previous studies. A majority of the variables included in the final model specification are statistically significant at the 1% level. Some parameters, though statistically insignificant, were retained for the sake of completeness.

Table 3.5: Willingness to Pay (₹/Month). Mean WTP was estimated using coefficients from the model presented in Table 3.4. We categorized households by two wealth categories and based the WTP estimated on the median and mean estimated water usage. US$ 1 = ₹ 51 (Quarterly average for Jan – March 2012: Foreign Exchange Dealers Association of India)

		BMW		**AMW**	
		Mean Usage	*Median Usage*	*Mean Usage*	*Median Usage*
Punctuality	Water delivered exactly on time	30	18	160	118
Water quality	Improved Water Quality (IWS)	40	24	122	90
	Maintaining Water Quality (CWS)	-49	-30	-150	-110
Frequency and duration	Continuous Water Access (IWS)	38	23	117	86
	Continuous Water Access (CWS)	191	115	578	425
	5 hours delivered once every 5 days	61	37	186	136
	2 hours delivered once every 2 days	65	39	197	145
	5 hours delivered once every 2 days	106	64	323	237
Supplemental water supply	Supplemental borewell access	-26[a]	-16[a]	-5	-3

[a] Sensitivity to supplemental borewell access for BMW households was specified as a random parameter with a normal distribution, where the mean and the standard deviation of the distribution are the model parameters to be estimated; here we only report the mean WTP. A statistically significant standard deviation for the normal distribution indicates that a subset of BMW households valued supplemental borewell access, while the remaining households valued their removal.

Table 3.6: Expected Monthly Water Bills (₹/Month). Only a subset of households showed us their bill. Of these households, we show results from CWS areas (n = 1131) since metered households in IWS areas were largely AMW and not representative of the total population. We calculated the mean and median water consumption across four rounds of data collection, for households below and above median wealth. We then calculated the expected bills for these volumes, for both IWS and CWS areas, and the difference between bills expected in IWS and those expected in CWS areas. US$ 1 = ₹ 51 (Quarterly average for Jan – March 2012: Foreign Exchange Dealers Association of India)

	BMW		AMW	
	Mean Usage	*Median Usage*	*Mean Usage*	*Median Usage*
Monthly Bill *(IWS Tariff - Metered Household)*	107	90	154	131
Monthly Bill *(CWS Tariff)*	213	148	408	313
Bill increase *(Conversion from IWS to CWS)*	106	58	254	182

To ease model interpretation, we calculated WTP measures for each of the relevant attributes. As mentioned in Section 2 and shown in Table 3.4, sensitivity to volumetric tariff was specified as a function of the estimated monthly water usage and wealth of the household. As a result, and as one would expect, households with differing levels of income and water consumption exhibit different WTP for the same changes in water services. Table 3.5 shows the WTP for different improvements to the water service for BMW and AMW households, calculated using the mean and median estimated water usage, taken from our own survey. The mean estimated water usage in BMW and AMW households was 7 Kl/month and 14 Kl/month, respectively. The median estimated water usage in BMW and AMW households was 4 Kl/month and 9 Kl/month, respectively. The WTP estimates are not significantly different from expected monthly bills, shown in Table 3.6 and calculated using the local tariff structure (see Table 3.2) and the mean and median water consumption in observed water bills from CWS areas. The mean observed bill for BMW and AMW households in CWS areas was 18 Kl/month and 26 Kl/month, respectively. The median observed bill for BMW and AMW households in CWS areas was 15 Kl/month and 22 Kl/month, respectively.

Over subsequent paragraphs, we go over the estimation results in greater detail. Punctuality was measured by whether the water is delivered exactly on time or not, and the impact of the variable choice was differentiated by wealth category. For BMW households, the effect of punctuality was found to be positive but statistically insignificant. For AMW households, the effect of punctuality was found to be positive and statistically significant, and twice the magnitude of the estimated effect for BMW households, likely a reflection of a greater value of time among wealthier households.

Water quality was differentiated based on whether the household was in an IWS or CWS zone. For households in IWS zone, the reference case was that water quality is the same as that they are currently receiving. For households in CWS wards, the reference case was that water quality is the same as it was before CWS began. Both coefficients were significant, but the resulting interpretation differs depending on the household's past experience with CWS. Households belonging to IWS zones show a strong positive preference for improved water quality, but household belonging to CWS zones indicate an equally strong inclination to return to the water quality before CWS began.

In Hubli-Dharwad, the water quality found at the tap in the CWS areas is much improved over water quality at intermittent taps, as verified by bacteriological measures and chlorine residual (Kumpel and Nelson 2013). Yet water users themselves do not have any way of detecting bacteria nor do they normally have awareness of international water quality standards. They judge water quality based on what they can detect in the water, namely the color, taste and smell. Therefore it is likely that our estimates of WTP for water quality are mostly a reflection on those aspects of water and not the level of health risk due to its consumption. We hypothesize that water users in the CWS demonstration areas do not like the taste of their water in comparison with water from intermittent areas. From experience on the ground we can verify that the water in CWS areas does, in fact, have a much stronger taste and smell of chlorine than the water in the intermittent zones. The measured residual chlorine concentration in the CWS areas is higher, on average (Kumpel and Nelson 2013). The estimated coefficient for the water quality attribute in IWS households was statistically significant from zero, and positive, as would be expected.

In order to estimate the value of frequency and duration, coefficients were calculated based on categorical combinations of frequency (in the number of days between water deliveries) and duration (in the number of hours per delivery). The coefficients for frequency and duration categories were estimated relative to the category of lowest utility, two hours of water once every five days. The coefficient for the 24 hours, seven days per week (i.e. CWS) was positive across all households, but significant only for households in CWS zones. Coefficients corresponding to all other combinations of frequency and duration were positive and significant across all households. Other models did not find a statistically significant difference between coefficients for these attributes when differentiated by the household characteristics of wealth category or current level of water services.

We wish to make two observations. First, it is significant that the WTP for two hours of water every two days and five hours of water every five days are not just statistically equivalent, the estimated WTP values are nearly the same. This indicates that neither frequency nor duration dominate the WTP. Likewise, the higher WTP for five hours of water every two days shows that the WTP for increased hours per week is what determines value for water users, and whether this is done through increased frequency or longer durations did not make a difference for the WTP for weekly availability included in this study.

And second, households in the IWS areas had a small and statistically insignificant WTP for CWS: these households were willing to pay less for increasing water availability from two hours every five days to 24 hours per day seven days per week, than for an increase in water from two hours every five days to five hours every five days. This indicates that without exposure to CWS water coverage, households do not have the same value for continuous water service delivery as they do for improved IWS. This is in stark contrast to those households who currently enjoy CWS: they had a large, positive, statistically significant WTP for the stated preference attribute which gave them the 24-hour, seven-days-per-week water availability that they currently enjoy. There are many possible explanations for this; some of these households expressed concern that CWS service would cause people to waste water; they also expressed doubt that the water utility was capable of maintaining that level of service in the long term (Burt and Ray 2014). It is possible that households who had experienced CWS had had these concerns allayed somewhat. Furthermore, the WTP for CWS among households who currently have CWS was surprisingly large. This may have been in part due to value derived from punctuality being 'packaged' with the value of increased water availability.

The mean effect of supplemental borewell access was not found to be statistically significant for all households. However, there is considerable heterogeneity among BMW households, as indicated by a statistically significant standard deviation for the corresponding normally distributed random taste parameter. A subset of roughly one half of BMW households exhibits a positive WTP for supplemental borewell access. The remaining households display a negative WTP for the same. Furthermore, the WTP has a high standard deviation: for BMW households with median water usage, the standard deviation was estimated at 227 rupees/month, indicating that a small subset of BMW households are entirely reliant on supplemental borewell access to fulfill their needs, and are consequently insensitive to the tariff structure. In contrast, the impact of supplemental borewell access seems to be consistently negligible across AMW households.

Finally, sensitivity to volumetric tariff was found to be higher for BMW households , as would be expected based on income and wealth effects. Estimated water usage was found to have a significant influence on the estimated coefficient for the volumetric tariff, despite the fact that it was much lower, on average, than the water volumes observed on utility bills. Although the estimated willingness to pay per month increased with higher estimated water usage, households decreased their willingness to pay per kiloliter as estimated water usage increased, as would be expected with a declining marginal value of water.

3.4 Policy Recommendations

KUWASIP has succeeded in providing CWS water to 10% of Hubli-Dharwad. The service is relatively reliable; roughly half of the households in our study never faced a service disruption during the study period, while for those that did, 87% of them had water restored within 24 hours (Ercumen 2013). The water quality at the tap meets national and international drinking water standards significantly more consistently than in IWS areas (Kumpel and Nelson 2013). Water users receiving CWS services value the convenience and state that they are willing to pay relatively large tariffs in order to keep it. Yet it was made available only through a large upfront investment made possible by a WB loan through a process of privatization. Not all municipalities in India have access to such funds, while still others may choose to keep water services firmly in government control. Many water utilities are heavily subsidized by local, state and central governments and their tariff structures are kept low in order to guarantee access for low income households. This process limits the amount of funding available for both network expansion and maintenance of infrastructure and equipment, leading to lower levels of service and thus lower tolerance for tariff increases (Whittington 2003).

For such cases we present evidence that small improvements in IWS may still be worthwhile, both in terms of public welfare as well as revenue collection. For urban water utilities that cannot, or do not wish to upgrade to CWS, improving one or more characteristic of water services may require a lower upfront investment and a smaller shift in the budget and technical expertise of their operations and maintenance staff. According to our estimates, water users in Hubli-Dharwad are willing to pay for increasing the frequency of delivery, increasing the duration of delivery, improving water quality and improving the punctuality of water delivery. Some low income users also value access to free, supplemental borewells. Although any of those improvements will most likely require some increased spending and possibly investment in infrastructure on the part of the utility, they also might improve water user satisfaction and therefore improve bill collection rates and make tariff increases more politically feasible. We note that the estimates of WTP for sub-samples of our population, specifically categories defined by use and wealth, should not be directly adopted in a tariff structure, but rather are presented here in order to give the reader an idea of the spread of WTP across the population.

Water users from IWS areas prefer improved IWS over CWS, while users from CWS areas have large positive WTP for the continuation of CWS. This is significant because it shows that not all IWS systems are created equal: from the end-user's perspective incremental improvements in IWS hold value; sometimes being more valuable even than CWS. Therefore, it may improve public welfare as well as utility revenue collections if utilities in India implement some incremental improvements in service, even if they are not able to upgrade their services to full CWS.

Adaptation to new, improved services seems to have significant effects on WTP; this may be due to an allaying of fears previously held before CWS was implemented. For example, households may have increased trust that the utility is able to deliver CWS, or they may have observed that increased availability coupled with a volumetric tariff and full metering does not lead to significant increases in water wastage. Additionally, the large positive WTP for CWS among households which have become used to CWS indicates that conversion to CWS should be carefully considered; if systems are not designed such that CWS can be sustained over the long term, the conversion back to IWS in the future might be quite painful for these households. There have been questions raised about whether Hubli-Dharwad has sufficient supplies to scale up CWS to the rest of the city (Jayaramu, Burt, and Manoj Kumar 2015; Sangameswaran, Madhav, and D'Rozario 2008); our results indicate that significant effort is warranted among policy makers and water managers to prevent conversion back to IWS after scale up.

Based on the estimated WTP for water quality, there seems to be a significant number of households which prefer the taste of the water in IWS. It may be assumed that eventually water users will adjust to the taste of increased chlorine in their water, since this does not seem to be an issue in many CWS systems in higher income countries. So the question remains: why haven't these households adjusted to the taste even after three years of CWS? One possibility may be attributed to the limited coverage of the demonstration zone. It is safe to assume that a significant number of people who live in demonstration areas drink water from IWS areas, either when they go to work, attend school or go about their daily activities elsewhere in the city. These water drinkers are therefore comparing the taste of more chlorinated and less chlorinated water on a daily basis. In this way, increasing the chlorine concentration in small sections of a larger city may prolong the period of adjustment to the new taste of water. IWS utilities looking to improve water quality should consider effects on taste; adjusting to higher concentrations of chlorine may have a negative effect on public support for such projects, if not handled properly.

Although AMW households seem to not value free, supplemental, public borewell access, according to our estimates, a subset of BMW households do. If free municipal borewells are already available in low income neighborhoods, water utilities should not cut off these households as part of an upgrade. Although many low income households may prefer improved piped water services, there is a subset of households which depend on free supplemental water access. Utilities that decide to remove secondary sources during a piped water services upgrade may be creating negative impacts for some low-income customers, although the exact household characteristics differentiating these particular customers, and their WTP for secondary sources are still unknown.

3.5 Conclusions and Future Work

Our study presents the results of a stated preferences experiment, which included five water service attributes: frequency, duration and punctuality of deliveries, water quality and supplemental borewell access. One limitation of this study is that additional attributes, not included in the relatively succinct experimental design, may be contributing to the local valuation of water. Another is the stated preference nature of the data: if future studies can make use of metered data, then revealed preferences may allow for some verification of the results of this stated preference model. Revealed preference data would not suffer from potential reporting biases inherent with stated preferences. In addition, and importantly, revealed preferences from metered data would also better account for the tradeoffs between prices and water quantity demanded. Given that revealed preference data is not available at this time, we have presented the results of a stated preference discrete choice model evaluating the WTP for incremental improvements in IWS, compared with CWS.

We find that water users in Hubli-Dharwad are willing to pay for water service improvements, including punctual water delivery, increased delivery frequency, increased duration of deliveries and improved water quality. We observed a subset of low income households exhibiting a positive WTP for free supplemental borewell access. We also find that water users in areas that currently have intermittent piped water deliveries prefer improved IWS over CWS, but water users that have experienced CWS for the last few years are willing to pay relatively large tariffs to keep that level of service.

Future work looking at the effect of experience in the urban water services sector is warranted. Future study is warranted on the effects of taste during upgrades aiming to improve water quality in piped water systems, whether those systems are incrementally improving IWS or converting to CWS.

Lastly, future study on the types of households that continue to value, and possibly depend on, free, public, supplemental borewells is also warranted.

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4 User Preferences and Willingness to Pay for Household Water Treatment Systems in Rural Tanzania[5]

Abstract

Rural areas of Sub-Saharan Africa suffer from low access to safe drinking water and high risk of fecal contamination in stored water. Household water treatment and safe storage (HWTS) systems, when consistently used, can provide safer drinking water. We located our study in two rural districts of Tanzania, with low-quality water sources and low-income inhabitants. We experimentally evaluated consumer preferences for six HWTS options, including boiling, through a simple ordinal ranking protocol. We estimated consumers' willingness to pay (WTP) for these options, using a modified auction. We allowed respondents to pay for the durable HWTS systems with cash or with chickens and found a significant minority chose to use chickens as payment. On average, our participants favored boiling, the ceramic pot filter and, in some cases, PuR. The WTP for all products was far below current retail prices, showing that significant scale up will need significant subsidies. Our work will inform programs aimed at scaling up HWTS in resource-constrained communities that must rely on poor-quality, and sometimes turbid, drinking water sources.

Keywords

developing countries, household water treatment and safe storage, HWTS, point of use water disinfection, user preferences, willingness to pay

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[5] Co-authored by Robert M. Njee, Yolanda Mbatia, Veritas Msimbe, Joe Brown, Thomas F. Clasen, Hamisi M. Malebo and Isha Ray

4.1 Introduction

In 2012 inadequate and unsafe drinking water was responsible for over half a million deaths from diarrheal diseases; 46% of these occurred in Africa.(Boschi-Pinto 2008) Rural areas of Sub-Saharan Africa suffer from low levels of access to improved water sources (such as piped water or protected wells and springs), and high risk of fecal contamination in stored water; therefore household water treatment and safe storage (HWTS) has been proposed as an intermediate solution to provide safer drinking water(WHO/UNICEF 2008). HWTS improves water quality and, if correctly and consistently used, can reduce the burden of disease associated with unsafe drinking water (Fewtrell et al. 2005; T. Clasen et al. 2007; B. F. Arnold and Colford 2007; Mark D. Sobsey et al. 2008).

Whether or not HWTS systems are a scalable intervention for poor and underserved rural populations is an area of active policy debate (Schmidt and Cairncross 2009; D. Lantagne et al. 2008; Schmidt 2014) Interventions aiming to encourage HWTS have rarely resulted in consistent use or maintenance over the long-term(Fewtrell et al. 2005; Enger et al. 2013; Brown and Clasen 2012) and this has led to several studies on user perceptions of HWTS products (Luoto et al. 2012; Albert, Luoto, and Levine 2010; Poulos et al. 2012). This study, building on the research of the past decade, is a contribution to the literature on which HWTS systems rural households may prefer and why they may prefer them (Mark D. Sobsey et al. 2008; Albert, Luoto, and Levine 2010; Poulos et al. 2012; Wood, Foster, and Kols 2012). HWTS options are simultaneously health interventions requiring behavior change and consumer products requiring investments of cash and labor (Thurber et al. 2013). Therefore we also estimate willingness to pay (WTP) for HWTS systems. Reaching scale will likely require at least partial cost recovery from users, and users who invest cash may use HWTS more consistently over time (Brown, Proum, and Sobsey 2009).

We located our study in rural Tanzania, where only 44% of the population has access to improved water sources (WHO/UNICEF 2014). Although national data is not available, a previous study found that 70% of rural households (N=292) do not adequately treat their water before drinking; this is in line with national surveys in neighboring Uganda and Zambia (Malebo et al. 2007; Rosa and Clasen 2010). The Tanzanian government has concluded that piped water will not be viable for rural areas for some years, and that HWTS should be scaled up as an intermediate strategy (MHSW 2014). We experimentally evaluated consumer preferences for six HWTS options, including boiling, that are available in rural Tanzania, in order to assess which have the greatest potential for widespread adoption and sustained use. We created a simple ordinal ranking protocol for categorizing preferences across many households and many HWTS methods. We estimated consumers' WTP for their preferred products using a real auction; we derived the subsidy levels required to reach 50% coverage within the sample population. We allowed respondents to pay for the durable HWTS systems with cash or with chickens in this cash-poor economy, where chickens are commonly used for saving and trading. Our work will inform programs aimed at scaling up HWTS in rural, resource-constrained communities that must rely on poor-quality, and sometimes turbid, drinking water sources.

4.2 Materials and Methods

Site Selection

We chose one predominantly Muslim, coastal district (Kisarawe) and one interior, predominantly Christian district (Geita), thus covering a range of cultures and geographies in Tanzania. From each district we obtained a list of five "water challenged" villages, i.e., those villages in which water had to be fetched from unimproved sources, which had had recent outbreaks of waterborne illnesses, and where the median socio-economic status (SES) was similar to that for rural Tanzania. These selection criteria matched the priorities of the government of Tanzania for any future scale up of HWTS. We found two villages in Geita (Katoma and Nungwe) and two in Kisarawe (Sungwi and Mitengwe) which matched our criteria and had village leaders who were willing to work with us (see SI Figure S2). All the villages relied on fetched surface or shallow groundwater for their domestic needs. Each village was a four-hour drive from the other village in the district, thus minimizing the risk of spillovers during the study. In each case we discussed our research goals and protocols, and the right of households to refuse to participate at any point, with the village leadership.

Our field team was made up of several of the authors and ten additional enumerators, whom the lead authors trained in survey techniques and ethical research practices. The team visited study households in June and July of 2011 to conduct a baseline survey of household assets, construction material for houses, water access, fuel usage, education and income, to verify that the chosen villages actually met our criteria of water challenged and low SES. We compared the baseline data with Census of Tanzania (2012) averages for all rural households (see SI Table S2). The data show that our study villages were comparable to rural Tanzania overall, and possibly slightly better off (as indicated by, for instance, a higher proportion of homes with iron sheet as opposed to mud/grass roofing). Private latrine coverage was close to 90%, suggesting that poor sanitation should not attenuate the beneficial health effects of safe drinking water (Eisenberg, Scott, and Porco 2007).

Sampling Strategy

We conducted our own household census in all four villages prior to the baseline survey. We defined a household as a family group that shared meals and lived in the same compound with one nominal head, i.e. an adult male or female with the authority to make decisions concerning medium-sized household purchases. One compound could accommodate more than one household.

We covered the entire geographic areas of all the villages for the census, but it is likely that we enumerated a majority but not all of the households located in the village. This census was our sampling frame. We randomly selected our sample households, by name, at open meetings in every village, to convince the residents that our selection process was fair. Our final sample size was 276 households for Geita and 280 for Kisarawe. The sample sizes were chosen to detect a 10% difference in usage between any two HWTS over the full sample at the 95% confidence level (see SI Figure S3 for HWTS-specific sample sizes).

The Six HWTS Options

We selected the study HWTS according to four criteria:

1) They had to be low cost. In rural areas, the median monthly expenditures per person was TSh 33,928 (US$ 21) and per household was TSh 172,271 (US$ 108).("Tanzania Mainland Household Budget Survey Main Report 2011/2012" 2014) We set the monthly cost for the consumables at no more than 4% of the median expenditure per capita(Hutton 2012), and the full price of the durables at no more than 33% of the median monthly

household expenditure. This yielded a maximum retail price of TSh 22 (US$ 0.014) per liter of water treated for consumable HWTS and TSh 57,000 (US$ 36) for a durable HWTS.

2) They had to be available commercially. In the short- to medium-term, the expansion of an existing supply chain is more realistic than the creation of a new product market.
3) They had to be portable. Migration is common, and families cannot move with heavy systems such as biosand filters.
4) They had to be efficacious with respect to expected source water quality, including turbidity.(Mohamed et al. forthcoming) This eliminated SODIS.

All HWTS products that were available in Tanzanian markets that fit these criteria were included in our study. Consumables included liquid sodium hypochlorite (Waterguard Liquid); sodium dichloroisocyanurate tablets (Waterguard Tablets); and sachets of Proctor and Gamble's PuR. The durables were ceramic pot filters (produced and distributed by Safe Water Now; reported flow rate 1-3 liters per hour) ("Ceramic Water Filter" 2015), and ceramic siphon filters (promoted by the Southern Highlands Participatory Organization; produced by Basic Water Needs of India; reported flow rate 4-5 liters per hour) ("About Basic Water Needs" 2015). All these options have significantly reduced *E. coli* concentrations in the laboratory (LeChevallier, Au, and World Health Organization 2004; Brown and Sobsey 2010; "Summary of Testing Reports from Basic Water Needs Ceramic Water Filters," n.d.) (with observations for the pot filter reported for a similar model from Cambodia), and in the field (albeit under widely varying conditions) (M. D. Sobsey, Handzel, and Venczel 2003; Thomas Clasen et al. 2007; Souter et al. 2003; Ziff 2008; Brown, Sobsey, and Loomis 2008). Boiling, the option most widely practiced in Tanzania, served as a comparison for the HWTS retail products; it has been shown to eliminate *E. coli* in the laboratory (World Health Organization 2011) and to reduce thermotolerant coliforms by 86.2%-99% in the field (T. F. Clasen et al. 2008; Thomas Clasen et al. 2008; Rosa, Miller, and Clasen 2010).

We distributed improved cookstoves to minimize the health impacts from any increased use of solid fuels from boiling (Smith et al. 2000), though boiling water contributes a small fraction (<15%) to total household fuel use (Thomas Clasen et al. 2008). All households also received a safe storage container of 20 liters, the volume treatable with one dose of Waterguard (if the water is not turbid) or two packets of PuR. The container helped to minimize recontamination of the treated water (Levy et al. 2008). The study households retained their storage containers and cookstoves at no cost after the study, as compensation for their time and effort.

Experimental Design

Following Scott et al. (2007), we developed a short informational program based on marketing principles for each participating household. Materials included an illustrated pamphlet on waterborne illnesses, catchy slogans on the importance of safe water, and a sticker for each specific HWTS in our study (see SI Figure S7) (Scott et al. 2007). We developed a training session for each HWTS to promote its proper use. Our field team demonstrated the use of the HWTS by treating a bucket of water in the home. The household member being trained repeated all of the steps back to our team, and, if any were incorrect, the training was repeated. We did this separately for each new HWTS being delivered, and affixed the appropriate informational sticker to the storage container before we left the household.

Households received the HWTS in a random sequence to avoid biases due to treatment order. Each participating household tested four of the six HWTS options that we evaluated, over the course of four rounds of evaluation. All were assigned a filter, a Waterguard product, boiling and PuR. Half the households were given PuR in its original packaging; the other half were given repackaged PuR with a label printed ‘Takasa Maji’ (‘Water Treatment’ in Swahili), to test whether generic packaging might affect usage or preferences.

Each round started with a five day ‘attachment period’, after which a member of our field team visited the households. During this visit households were asked about their source water, perceived water quality, water collection and water usage practices. The households then had four to six weeks to use their assigned HWTS, without interim reminders. At the end of each round our field team visited the households to collect the durable HWTS, distribute the next assigned HWTS, and collect HWTS use data. After the fourth round, we collected survey data on the preferences for each HWTS and conducted the WTP auction. The auction gave the households the chance to buy any of the products that they had tested. We informed them at the start of round one and round four that they could bid for their HWTS after all four rounds (the schedule followed is included in the SI Figure S4).

Outcome Measurement: User Preferences

Usage was defined as reported treatment by at least one member of the household in the previous two weeks. This shows recent use, and therefore willingness to use, rather than consistent daily use. Our field team also collected observational data on storage practices, filter usage, and chlorine in stored drinking water (with SenSafe Total Chlorine Test Strips) as indicators of recent use.

We created a simple, easily reproducible, ranking protocol for this study. At the end of all four rounds we presented our participants with four cards each with a picture of one of their assigned HWTS. We asked them to sort the cards into one of three categories: liked, disliked and neither liked nor disliked. They could put all four cards into one of the categories if they wished, and any category could remain empty. Then, within each category, they arranged the cards from the most liked to the least, and the most disliked to the least. We recorded HWTS preference rankings from the sorted cards, using similar data collection tools as Beggs and Cardell (1981), to obtain ranked, stated preferences (Beggs, Cardell, and Hausman 1981). We assigned a score of 0 to the neutral category, +1 through +4 for the 'like' category and -1 through -4 for the 'dislike' category; +4 signified the most liked HWTS and -4 signified the most disliked. A range of ranked HWTS systems provides policy and social marketing options that are more informative than simply reporting the household's most preferred choice (Albert, Luoto, and Levine 2010).

We compared two methods for estimating the population preferences: (1) parametric methods for estimating average rankings and confidence intervals, and (2) a discrete choice randomized utility model (RUM) (Train 2009). We used the RUM model to validate our ranking data rather than to estimate WTP (as in Beggs and Cardell) (Beggs, Cardell, and Hausman 1981); we estimated WTP using a modified auction game.

Outcome Measurement: Willingness to Pay (WTP)

Our field team conducted an auction game with the participants, adapted from Luoto et al (2012) and based on the work of Becker et al (1964), in order to elicit their WTP for any HWTS they had tried, plus the Waterguard product that they had not tried (the Waterguard products were considered identical to one another) (Luoto et al. 2012). First, the participants stated the highest price they were willing to pay for each HWTS they had used. They then selected one of five slips of folded paper, each with a different price, all less than the retail price of the HWTS. If the selected price was higher than their stated WTP, they "lost", and they could not purchase that HWTS. If it was smaller, they "won", and they could purchase that HWTS for the selected (not stated) price. This gave them an incentive to state a high WTP for HWTS that they wished to purchase, while preventing us from charging prices above retail. We practiced the auction with each household using a bar of soap, a common purchase for most participants, to ensure that the rules of the game were fully understood.

When piloting the auction protocol, we observed that several households did not have cash on hand for durable purchases such as buckets or clothes. When these households needed cash, they borrowed the money, sold some of their assets (such as chickens), or worked for extra pay. Since the bids for durable HWTS were more likely to be impacted by cash constraints for the relatively high-cost filters only, we gave the participants a choice of payment method. They could bid using chickens, cash or mobile money, and so could play the auction game even if they were cash-limited.

Ethics

Participants were briefed as to the details of the study and given the opportunity to ask questions and receive answers to those questions. Enumerators obtained informed verbal consent from each respondent prior to inclusion in the study. Our research protocol was approved for ethical compliance by both the University of California at Berkeley's Office for the Protection of Human Subjects and Tanzania's National Institute for Medical Research.

4.3 Results

Usage of HWTS

Self-reported usage (defined as at least once in the previous two weeks) of the assigned HWTS was high; the average across all rounds was 91% in Kisarawe, and 86% in Geita. High reported HWTS usage rates could reflect social desirability bias on the part of the households (King and Bruner 2000). Observational data and chlorine testing, however, were consistent with these stated rates of usage. In a random sub-sample of 179 households using Waterguard, PuR or 'Takasa Maji', 32 (17 %) did not have treated drinking water available at the time of the visit but 120 (67%) had total chlorine concentrations between 0.05 and 0.8 mg/L. These concentrations indicate usage more recent than the two-week recall period. For the pot filter, 96% of our observations showed that the equipment had been used recently enough for the filter to remain damp; for the siphon filter this was true for 90%. These data suggest that the majority had recently used their assigned HWTS, and so stated preferences and WTP estimates were based on experiential knowledge. The remaining consumables at the end of each round, an additional indicator of use, varied between 23% and 43% of distributed doses, on average.

Treatment responsibilities were highly gendered: 73% of households with adult women assigned the chore to women alone. Adults (above age 18) drank treated water more often than children (below age 5) did, though the latter are most vulnerable to waterborne illnesses: 98% of households with adult women reported that they drank the treated water, but only 77% of households with small girls reported giving them treated water. Respondents also told us why they treated their drinking water. Most cited cleanliness, the importance of treatment, or the need to get rid of germs, which were all messages included in our informational program.

User Preferences

Boiling and the pot filter were the preferred HWTS systems; their average scores were 1.9 and 2.0 (out of 4), respectively (see Figure 4.1). The Waterguard products and the siphon filter had negative rankings on average. Although the assigned rankings are ordinal, the results of the parametric methods were validated by the discrete choice model, and are simpler to replicate. The results of the estimated discrete choice model are in the SI Figure S5.

Households that reported their source water as “Clear, without any color” (58%) were classified as accessing sources with low turbidity, and households that reported “Cloudy /muddy/ rusty” as accessing turbid sources. The villages were similar in terms of socio-economic status (see SI Table S2), but only 16% of all households reporting highly turbid sources were in Geita while 57% were in Kisarawe. The ranking by source water turbidity (see Figure 4.1) suggest that turbidity was responsible for much of the difference in HWTS preferences across households.

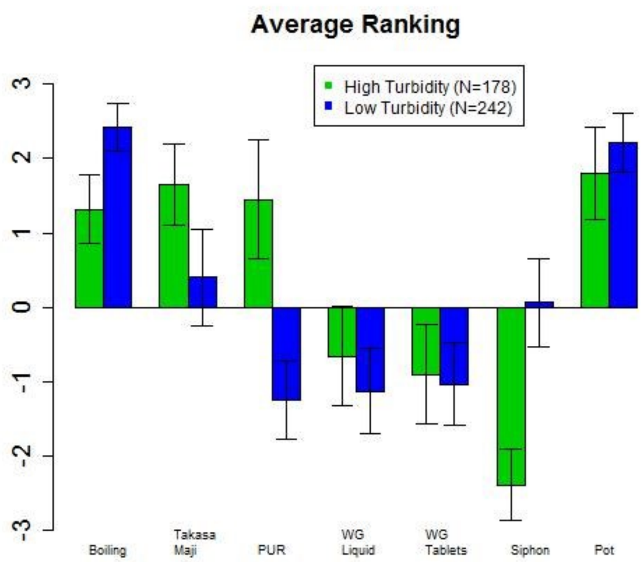


Figure 4.1: Average Rank Of HWTS, separated by high and low source water turbidity. X-axis lists the HWTS. Y-axis shows the average rank (possible range: -4 to +4).

PuR removes turbidity, and households with turbid water, mainly in Kisarawe, liked it more; this has not been the case for some previous studies (Albert, Luoto, and Levine 2010). In the pooled ranking data, Takasa Maji (1.11 ± 0.42, p=0.05) did significantly better than PuR (-0.42 ± 0.46, p=0.05), so it seems that generic packaging did not negatively affect preferences. The siphon filter also removes turbidity, but our study households complained that the flow rate slowed dramatically when treating turbid water; if true, this may explain why many disliked it. Boiling does nothing for turbidity, which appears to be reflected in the rankings. The HWTS most often ranked first or second by those who were assigned them were: boiling (66% of households), the pot filter (61%) and PuR / Takasa Maji (61%, but only when the source water was turbid).

We asked the participants what they liked and disliked about each assigned HWTS. The tally for specific attributes for each HWTS, when it was ranked most or second-most (dis)liked, is shown on the Y-axis in Figures 2 and 3. The number of responses varied by HWTS; these are listed on the X-axis. A household could cite more than one attribute, so the number of responses exceeds the number of responding households. Ease of use, taste and effectiveness were the most cited reasons for liking an HWTS (see Figure 4.2). Those who disliked boiling or the filters objected to their high time requirements, and bad taste was by far the most common reason for disliking Takasa Maji, PuR, and the Waterguard products (see Figure 4.3).

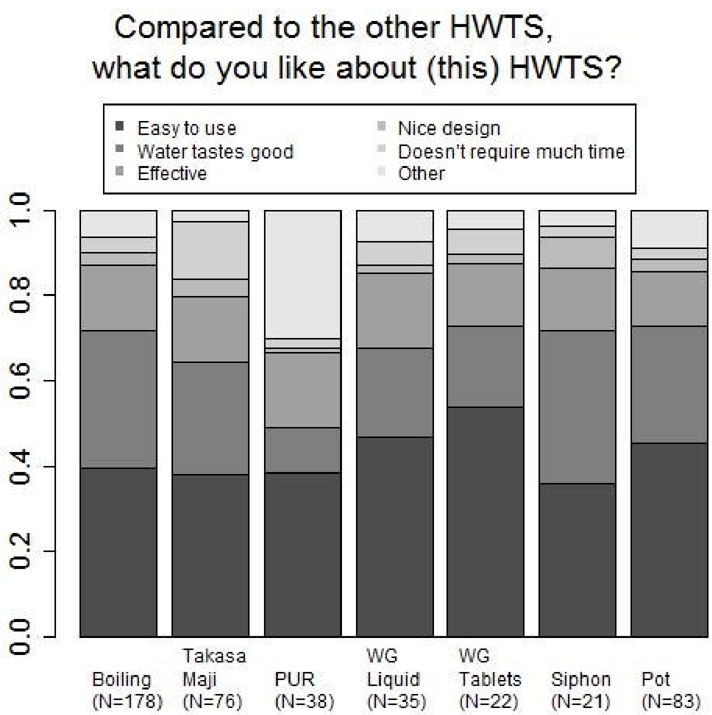


Figure 4.2: Reasons given for why participants liked their assigned HWTS when it was ranked most or second-most liked. The attributes reflect the respondents' subjective opinions. X-Axis shows number of responses for each HWTS. Y-axis shows tally of reasons given for each HWTS

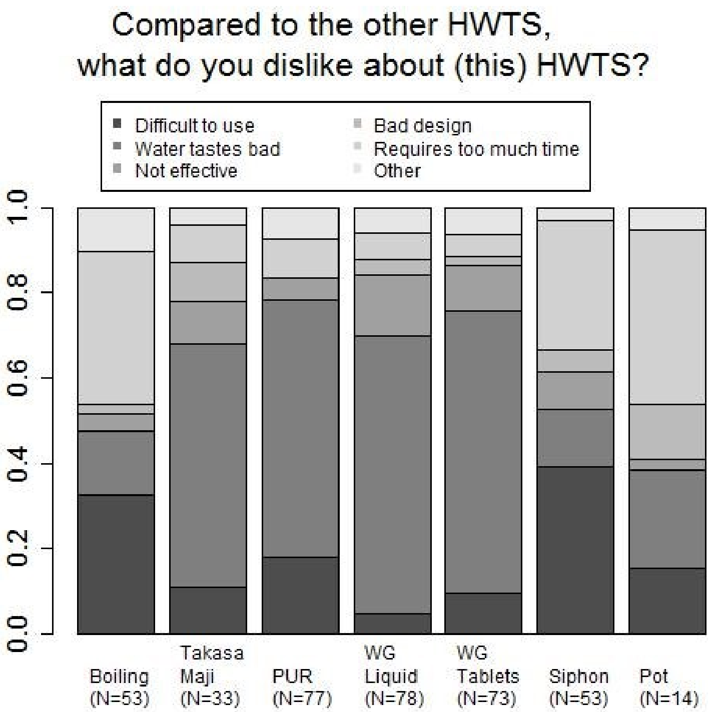


Figure 4.3: Reasons given for why participants disliked their assigned HWTS when it was ranked most or second-most disliked. The attributes reflect the respondents' subjective opinions. X-Axis shows number of responses for each HWTS. Y-axis shows tally of reasons given for each HWTS.

Willingness to pay (WTP)

At the end of the last round 453 out of the original 556 households remained in the study (the drop-out rate averaged 6% per round). All our study households were willing to rank their assigned HWTS systems, but 26% of the households in Geita and 15% in Kisarawe declined to play the auction game. Some households who played the game bid "zero" for one or more of the HWTS. Table 4.1 shows the number of bids per HWTS, along with their mean bids and retail prices. We did not include boiling in the WTP game as the participants retained their improved cookstoves for free. Most respondents who declined to bid said they lacked the resources to make any purchases. Although they did not participate in the auction game, they are incorporated into our bid curves (see below), as their stated WTP is, in effect, zero for all of the commercial HWTS. Ninety-three percent of those who bid had not previously purchased any of the study HWTS, and did not know what the expected retail prices were. This shows that their WTP was not constrained by actual retail prices (a small number of bids were higher than retail). A sizable minority (12%) of the pot filter bids were placed using chickens instead of cash. 92% of all bidders "won" at least one auction, and of those 14% declined to purchase anything. If households "won" more than one auction, they were given the option to purchase any HWTS for which they won. The probability of purchasing a pot-filter was 1.3 times that of purchasing PuR when both were won; pairwise comparisons for the other HWTS are in the Supporting Information (see Table S9).

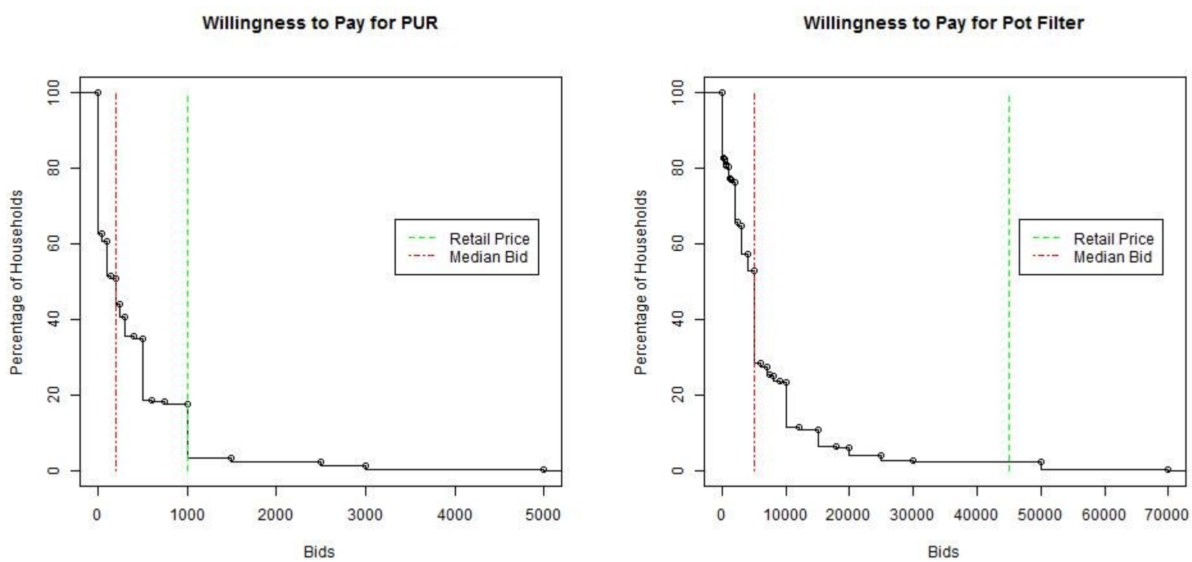
We obtained retail prices for the commercially sold HWTS from the organizations distributing them, and verified the prices at retail outlets in Dar es Salaam. The median bid was half the retail price for PuR and roughly 1/3 of retail for the Waterguard products. Since the filters were durable products their bid prices were much higher, but the bids represented a smaller percentage of the retail price. The median bids for the siphon filter and the pot filter were 7% and 11% of retail, respectively. Among our respondent households, 28% were willing to pay the retail price for PuR (see Figure 4.4), and 19.0%, 21.7%, 0.8% and 1.8% of participants were willing to pay the retail prices for Waterguard Liquid, Waterguard Tablets, the Siphon Filter and the Pot Filter, respectively (see Figure 4.4 and Figure A11 in Appendix A).

Table 4.1: WTP bids for HWTS. Mean bids include stated zero bids; refusing to participate in the auction was also counted as a bid of zero. The average exchange rate in 2012 was TSh 1590 = USD 1 (IFEM 2015)

		Mean Bid (TSh)	95% CI	Number of Bids	Number of Bids = Zero	Retail Price (TSh)
Siphon Filter (1 Filter)	Kisarawe	1141	±367	94	33	15,000
	Geita	1341	±390	113	40	
	All	1250	±270	207	73	
Pot Filter (1 Filter + Container)	Kisarawe	9780	±1936	108	12	45,000
	Geita	3031	±447	127	27	
	All	6146	±1019	235	39	
Water-Guard Liquid (1 Bottle)	Kisarawe	742	±167	202	58	1,500
	Geita	445	±86	239	103	
	All	581	±91	441	161	
Water-Guard Tablets (10 Tablets)	Kisarawe	412	±82	202	66	1,000
	Geita	271	±53	239	103	
	All	336	±48	441	169	
PuR (5 Packets)	Kisarawe	595	±133	108	23	1,000
	Geita	321	±105	112	43	
	All	455	±86	220	66	
Takasa Maji (5 Packets)	Kisarawe	357	±107	94	24	-
	Geita	324	±108	127	55	
	All	338	±77	221	79	

The mean bid for households with highly turbid source water was higher than that for households with low turbidity for all HWTS except the siphon filter. The difference was large for PuR (low turbidity: 383 ± 81, high turbidity: 662 ± 222, p=0.05), Takasa Maji (low turbidity: 251 ± 82, high turbidity: 415 ± 134, p=0.05) and the pot filter (low turbidity: 5022 ± 918, high turbidity: 7381 ± 2323, p=0.05). All these HWTS remove suspended solids. The WTP data, taken at face value, indicate that either much cheaper versions of the preferred HWTS will be necessary for scale up, or that significant subsidies will be needed in the current economic conditions and under current prices.

Figure 4.4 : The Ceramic Pot Filter and PuR Demand Curves with Retail Prices and Median Bid Prices. X-Axis shows number of Filters and PuR packets demanded. Y-axis shows WTP, based on bid prices.



4.4 Discussion

This study was motivated by the Tanzanian government's focus on providing safe drinking water for the rural poor through an HWTS-based strategy. The safe water literature has convincingly argued that, unless a large majority of local community members use HWTS correctly and consistently, they will not provide the potential health benefits of safe drinking water (Fewtrell et al. 2005; T. Clasen et al. 2007). We evaluated consumer preferences for six HWTS products through a simple ordinal ranking protocol, in order to find the one(s) with the potential to reach the greatest number of households. Ours is the first study that we are aware of to compare boiling and non-boiling HWTS, as well as the first to integrate both user preferences and WTP. We use the WTP for each product in order to estimate demand and the subsidies that might be needed for scale up. We maximized the number of households willing to bid for HWTS by allowing them to bid with their assets (chickens), instead of with cash alone, a novel payment method which mimicked the actions that cash-poor households would have to take to buy durable goods.

The results of the user preference ranking exercise indicate that, to the extent that our study participants reflect rural residents across Tanzania, and before costs are factored in, boiling (with an efficient stove) and the pot filter (with a storage container) are the most preferred HWTS options. The pot filter was preferred across districts and across source water quality, as found by Luoto et al (2011) and Poulos et al (2012); we found preferences for boiling to be on par with the pot filter (Luoto et al. 2012; Poulos et al. 2012). Where the source water was significantly turbid, an effective disinfectant-coagulant such as PuR, was also preferred. Our WTP estimates indicate that reaching 50% of the target population would require subsidies of up to 89% of retail for the pot filter with its container; the median bid in these low-income communities was TSh 5000, or 11% of the retail price. If the goal is to reach 50% of households with turbid water with PuR, the retail price might need to drop by 74%. These low WTP figures have also been reported in previous research (Ahuja et al 2010 has a good review), with revealed WTP studies almost always yielding lower numbers than stated WTP (Ahuja, Kremer, and Zwane 2010; Kremer et al. 2009; Luoto et al. 2012; Vásquez et al. 2009; Orgill et al. 2013). The development of less expensive alternatives is promising, however: we found that a generic disinfectant-coagulant would be as acceptable to consumers as PuR.

We found that some households, even when they reported disliking an HWTS such as Waterguard, still bid on it. This could have been a way to acquire a product at a low price, either for occasional use, or for the chance to re-sell it at a later date. Our data for all HWTS do show that those who liked a product bid higher than those who disliked it. Following the household water literature, we argue that preferences are an important indicator of what might be used (and replenished) (Albert, Luoto, and Levine 2010). The WTP data, on the other hand, are best treated as a guide to the subsidies needed to achieve desired levels of consumer demand. Extrapolating primarily from preferences, the pot filter and boiling would face fewer barriers to adoption and use than the other products, and, given a choice of options, Waterguard products and the siphon filter are unlikely to be as successful.

Boiling is the most accessible and most widely used option within our study population (Rosa and Clasen 2010). Gathering fuelwood and heating water requires time and labor, yet, for a majority of the households, the time savings from the other HWTS were not enough to induce a WTP that was even close to their retail prices. In all dimensions other than time required, boiling beat PuR, Waterguard and the siphon, and it was a strong rival to the pot filter. Because of recontamination during storage, if the Tanzanian government decides to promote boiling water as a health measure, we recommend including a safe storage container at minimal cost. In our study all of the households owned buckets, but not all of them had lids, and none had spigots attached; furthermore subsidized safe storage containers could include safe water messages and instructions for disease prevention. The retail value of our safe storage container was TSh 8,000 (US $ 4.76); this would require significant subsidies for a national scale up.

We estimate that half of rural households might adopt the pot filter with a storage container if a combination of subsidies and price reductions totaling TSh 42,500 (US$ 28) were provided. Likewise, if PuR, or a similar coagulant-disinfectant, were to be made available at a price of around TSh 50 (US$ 0.03) per packet, then this might be a “sweet spot” where rural households could afford to regularly purchase such a product, especially in communities with turbid water sources. However, subsidies for consumables often have to be continued indefinitely in very low-income communities. We conclude that consumer-approved and efficacious household water treatments exist for rural Tanzania, but that the willingness (and ability) to pay for these is modest. For a country looking to scale up HWTS but with a public health budget of TSh 29,513 (US$ 18.54) per capita, there are no “low-cost” options to safe drinking water for all (MoF 2013; DeSA 2013).

Our study had several limitations. First, we provided the pot filter within a container designed by our research team. In Tanzanian markets the ceramic filter is sold by itself and put inside a 20 liter bucket, but, during pre-survey piloting, we found that the standard bucket had insufficient storage space. Our preference and WTP results thus reference the filter and container together. Second, we provided a locally manufactured efficient stove as part of the boiling treatment; therefore, an expressed preference for boiling could have partly reflected an affinity for the cookstoves for all purposes and not expressly for drinking-water treatment.

Third, filters and consumables are inherently difficult to compare because the former retain their value despite repeated use. We encouraged households to express their preferences based on their overall experience, and specifically asked them to evaluate the HWTS according to ease of use, taste, aesthetics, perceived effectiveness and time required. We thus tried to elicit user preferences that were based on product characteristics besides resale value. The results show that durability may have affected preferences, but did not eclipse other product features (such as ease of use) or relevant household characteristics (such as source water turbidity). Fourth, usage rates (reported or observed) are a potential indicator for the frequency of use after adoption. But households may have been influenced by our frequent visits, resulting in a reactivity bias. Therefore these usage rates may not be indicators of use in the long term.

Finally, it is unclear what other challenges exist to making any of these HWTS available throughout Tanzania; supply chain constraints were not explicitly addressed in this paper. Further study is warranted on the creation of a reliable supply chain for multiple HWTS systems, in particular for the pot filter and efficient cookstoves. Combining such data with the results of this study would provide a more complete picture of how (and if) to scale up HWTS in rural Tanzania.

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5 Conclusion

At least 1.8 billion people do not have affordable and reliable access to drinking water free of microbial contamination. A range of current technologies at urban utility, small community and household scales are efficacious against microbial contamination. But effectiveness in providing safe water or positive health outcomes in the field remains highly varied. Piped water is considered the most improved form of access but it is only slowly being expanded in low-income regions. Even under piped water systems with IWS, it is advisable for consumers to adopt HWTS. Uptake, consistent use and affordability for the poor remain major challenges for HWTS in both piped and non-piped systems. Despite existing advocacy of household water treatment methods to mitigate microbial contamination, the literature suggests that most HWTS-based systems, with the possible exceptions of boiling and ceramic pot filters, are unlikely to be transformative at scale.

Technology descriptions and assessments dominate the reviewed safe water literature, but technologies are only part of a safe water system from source to sip. Effectiveness or lack thereof, and low costs of provision or lack thereof, which are routinely attributed to technological interventions, are, in fact, characteristics of the technology *plus* its delivery (or business) model, and its accompanying marketing and mobilization activities. Assessments and comparisons of efficacy and cost-effectiveness are only meaningful along a specific source to sip pathway. The entire range of costs incurred -- including the socially borne enabling costs of outreach, mobilization, failures and transitions from unsafe to safe water should be transparent to researchers, safe water advocates, and policy makers. To reach the goal of safe and affordable water for all, I conclude that a systemic approach to safe water services is more useful than intervention-by-intervention assessments.

Understanding end-user preferences is the first step towards accounting for, and then possibly minimizing, the costs of marketing and mobilization activities. Successful safe water delivery models must incorporate the end-user as an essential, if not central, component of any S2S system, as their participation is required, either as a consumer or as a participant in an informal co-production process for safe water services. The beliefs, practices and experiences of the end-users are a part of the S2S system, just as much as the wells, filters, pipes and storage tanks.

While the whole system, from S2S, should be included in impact assessments, I have placed the perspective of the end-users, as the basis for evaluation. End-user preferences and WTP indicate both which policy choices are the most preferred, but also provide information about the likelihood of success. My observations on how end-users in rural Tanzania experience, implement and value water collection and treatment illuminated some possible reasons why many HWTS fail to create large scale uptake and sustained use, and pointed towards which HWTS had the most chance for a successful scale-up. Understanding how end-users in urban India experience water access and collection illuminated some possible reasons why CWS provided benefits at perhaps lower levels than policy makers had hoped. Understanding how end-users value water services provides suggestions on what future upgrades should look like, in order to create services that people value and are willing to pay for. A few points are presented in

Table 5.5, which summarize my contributions to the research literature and water policy that were presented in this dissertation.

Table 5.5: Summary Points. This is a list of my contributions to the research literature and recommendations for drinking water policy taken from this dissertation.

<u>Summary Points</u>

1. Safe drinking water from *source to sip* (S2S) consists of a series of interactions between technologies, their delivery models, their scales and costs of production, and consumer uptake and consistent use. Safe drinking water is a system, not a product or an intervention.

2. Within the framework of an S2S system, particular focus on the preferences, WTP, access, behaviors and beliefs of the end user is important for the design of drinking water systems.

3. Water users seem to prioritize convenience, reliability, taste and smell, sometimes more than water quality. Interventions aimed at improving water quality should take into consideration these other system characteristics as well, in order to improve uptake and acceptance, and to encourage correct and consistent usage. This was true in both piped and non-piped systems.

4. There is a positive WTP for improved water quality as well, but end users sometimes conflate water quality with taste and smell, and may prioritize taste, smell and clarity, especially in systems with noticeable chlorine residual or turbid source water. This was true in both piped and non-piped systems.

5. Of piped systems with IWS, there is a positive WTP for improved punctuality, increased frequency and longer duration of deliveries. In Hubli-Dharwad, the WTP ranged between one third and double the amount of a bill increase due to a conversion from IWS to CWS.

6. For piped systems with IWS or CWS, where there is a history of free access to a supplemental water source, some subset of poor households will likely depend on continued access to that source.

7. Of HWTS, users with clear source water seem to prefer ceramic filters and boiling to other options, while users with more turbid source water prefer ceramic filters and PuR; HWTS that use chlorine by itself are generally disliked when other choices are available.

8. For HWTS, it may be necessary to subsidize at least the most cost-effective systems in particular contexts (i.e. those with low costs per DALY averted) in order to bring them to scale. In rural Tanzania and other rural areas with similar levels of income, the subsidies needed in order to create enough demand to cover 50% of the rural population were between 80% - 97%.

5.1 Reflections and Future Work

There are many things that I would do differently with regards to the research contained in this dissertation, if I could do it all over again. In particular I would expand the attributes included in the stated preference experiment conducted in Hubli-Dharwad, so that I might be able to comment on a larger set of water service attributes, including taste and smell, seasonal and long term reliability and improved water quality in the borewells. I would also try to verify my results using some revealed preference data; although this is not possible for IWS areas, the household level consumption data does exist in CWS areas and might have allowed some limited verification at least of the value of CWS itself, and perhaps a volumetric WTP for piped water. Lastly, I would have specified, and then varied the time required in waiting for a late delivery and for collecting water at the supplemental borewells, as this would have allowed me to estimate a local time value. This would have been another good verification of our results, if our time value estimate was reasonable and within range of the local wages. In addition, I would have been able to use the time value estimate in a future evaluation of the costs and benefits of KUWASIP in Hubli-Dharwad, an additional study which was part of the original survey but not included in this dissertation.

In Tanzania I would have provided a different gift than the efficient cookstove; providing the cookstove as compensation for participation unnecessarily confounded our results regarding user preferences for boiling. Also, I would have tried to estimate the costs of boiling among our sample population, to have a more detailed comparison with the retail prices of the other HWTS. Although field logistics rarely match the ideal we strive for, a tighter schedule for the evaluation rounds, with less of a range in the lengths of evaluation time, would have been preferable.

In the future I will build on my previous research, through continued emphasis of impact evaluation through the end-user's perspective. But I will expand my topic of study to include urban and rural sanitation services. Concentrating only on drinking water ignores the many other ways that people interact with water, and the most common source of drinking water contamination: human waste. The same public health goals are served by creating sustainable sanitation services, as by treating and protecting drinking water. Creating barriers between water used for drinking and water used for washing and carrying waste can be done at any point within the cycle of disease which spreads water borne illnesses across a population. In addition, sanitation access may play an even bigger role in the expansion of freedoms than safe drinking water access, since it has large cultural and symbolic value. Many cultures associate dignity with access to sanitation services which afford some privacy, and often assign designations of uncleanliness to populations that lack access to any sanitation. Thus humiliation might also be reduced and self-respect increased along with a reduction in the incidence of waterborne illnesses. Such cultural valuations would be reflected in user preferences and WTP using similar research tools to the ones used in my dissertation, and could be further explored through in depth interviews and focus groups.

I have thus far concentrated on expanding freedoms, as defined by Sen and as expressed by end-users through preferences and WTP. Yet this approach implicitly assumes that the new freedoms acquired by end-users through improved access to safe drinking water will be sustained over time. In so far as water supplies are threatened by local resource competition, the degradation of local ecosystems, or by shifts in rainfall patterns due to climate change, then this assumption will prove false. Therefore I hope to incorporate local water supply forecast models, and expand my evaluation of water use practices to include water re-use practices as well, in order to incorporate environmental sustainability as an additional dimension of impact evaluation and water management policy. Since water re-use involves the management of waste water streams this work will synergistically benefit from the expansion of my topics of study to include sanitation services as well.

Lastly, in the future I plan to explore ways in which low-cost sensor technologies might be incorporated in urban water management systems. Low cost sensors have the possibility to create more efficient information transmission between end-users and the managers of water and waste water resources. This has the possibility of allowing managers to monitor decentralized systems, whether this is the locations of septic systems that need emptying, leaks in piped water networks, or perhaps in the near future, the usage and effectiveness of HWTS. There is also the possibility that preferences can be communicated as well, for example smart meters might allow demand modeling based on real-time meter level consumption data.

Sensors might allow for even more synergistic improvements, increasing the possibility for increased monitoring all along the chain of water and waste water management. Such information might not just be transmitted between end-users and water managers, but from end-user to private service providers, or from private service providers to municipal water managers. For example a household sensor might tell a privately managed vacuum truck service where to collect fecal sludge, while another sensor might tell the municipal water manager how much fecal sludge was collected and whether it was released in a location that properly treats and disposes of the sludge. This increases the possibility of not just improved health outcomes, but also decentralized systems that allow improved environmental outcomes, and reuse of resources without heavy capital investments by the municipality. Such systems are pure speculation at this point, but the potential that they represent warrants further exploration. New market mechanisms are possible when transparency, monitoring and information transmission are improved; reinventing the toilet may not be necessary if we can simply reinvent the market for sanitation services itself.

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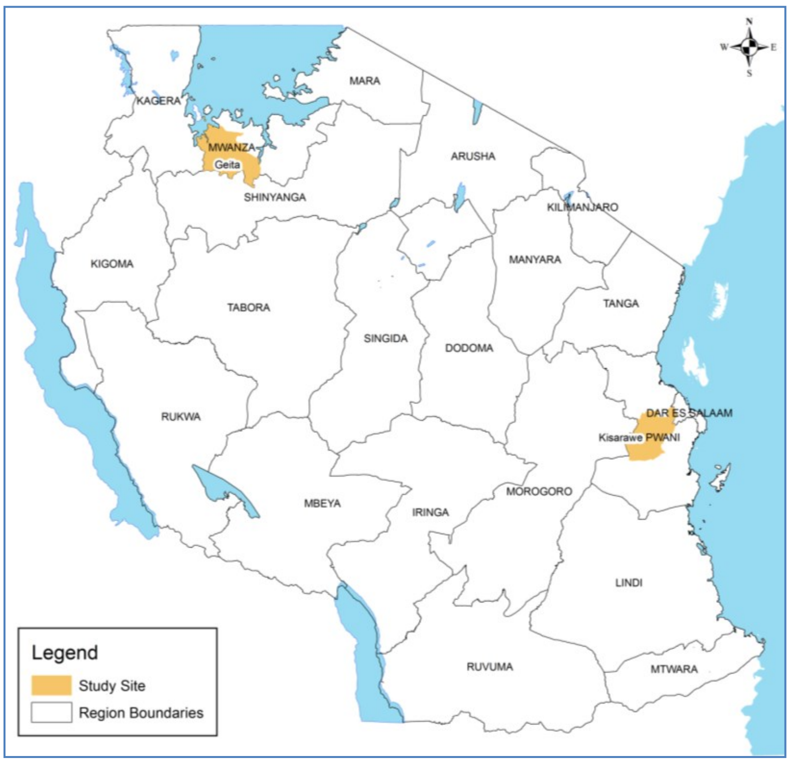
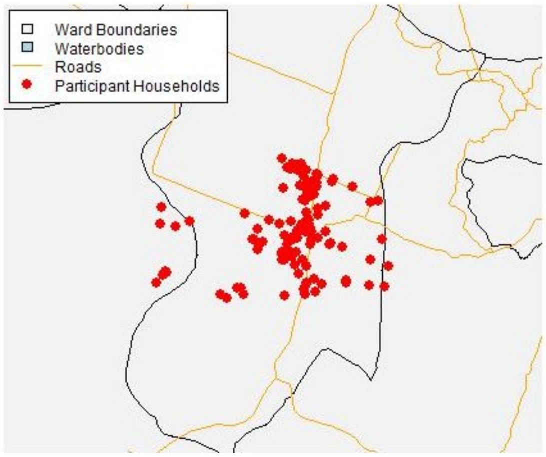
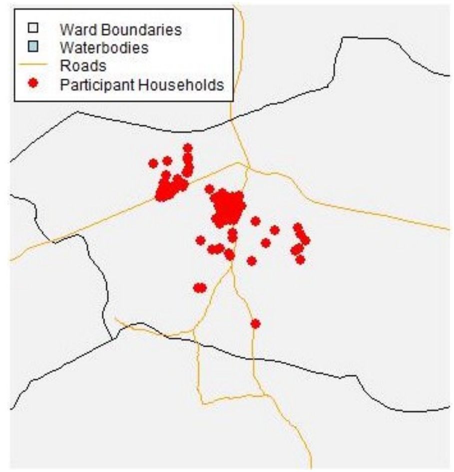
Appendix A: Supplemental Information for Chapter 4

Figure A1: Maps of Study Locations and Participant Households in Geita and Kisarawe. National map with the locations of Kisarawe and Geita Districts in Tanzania. Ward level maps with the locations of participant households in Kisarawe District and in Geita District

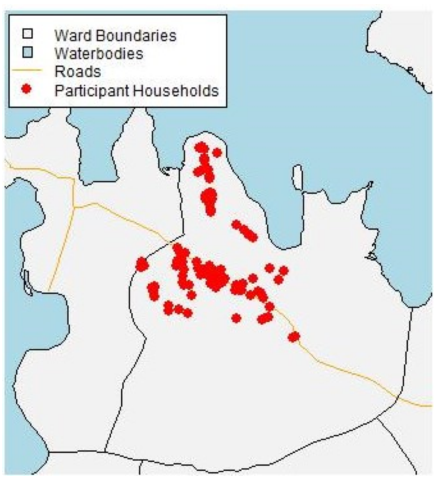




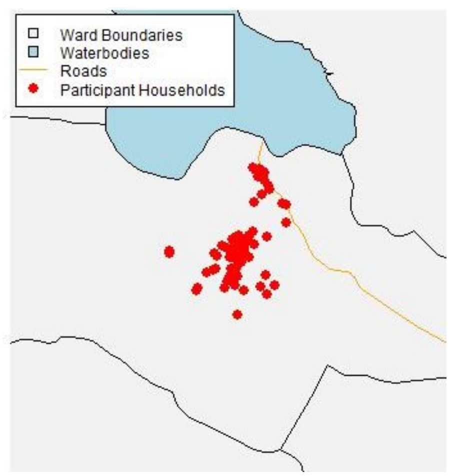
a) Sungwi Village, one of three villages in Masaki Ward



b) Mitengwe Village, one of four villages in Mzenga Ward



a) Katoma Village, one of five villages in Katoma Ward (Katoma was recently divided into three villages; Katoma, Itale and Nyakazeze)



b) Nungwe Village, one of six villages in Chigunga Ward

Table A2: Socio-Economic Status Across Districts: Assets, House Construction Material, Water Sources and Cooking Fuel. Study data is compared with data from the National Household Survey and the 2012 Tanzanian Census. Households in Kisarawe and Geita had similar asset ownership rates to the averages found for all of rural Tanzania. Exceptions included large livestock ownership in Kisarawe, Kerosene lamp and bicycle ownership in Geita and ownership of chickens and mosquito nets in both places. Education levels in Kisarawe and Geita were low: Nearly 1/3 of household heads had not completed primary school, while just under 2/3 had not completed secondary school. The majority of households in both districts classified themselves as “peasants.” Kisarawe had a greater coverage of latrines (91%) than Geita (72%), but coverage was high in both districts. Public dug wells were the most common water source in both districts with one exception: rainwater harvesting in Kisarawe was more common, but only during the rainy season.

	Kisarawe	**Geita**	**Tanzania**
	Study Sample[1]	Study Sample[1]	Rural Households[2]
Cows	0%	21%	22.3%
Sheep, goats	1%	35%	
Goats			25.2%
Sheep			9.8%
Television	4%	2%	0.6%
Bank account	4%	6%	5.5%[3]
Motorcycle / scooter	6%	2%	4.2%
Kerosene lamp	50%	23%	58.2%
Bicycle	51%	71%	45.7%
Cellular phone	53%	49%	54.2%
Mattress	66%	74%	89.5%[3]
Radio	68%	48%	58.1%
Chickens, ducks	76%	75%	47.6%
Mosquito net	77%	93%	61.3%[3]
Primary Cooking Fuel : Firewood	91%	97%	90.2%
Primary Floor Material: Mud	80%	85%	60.0%
Own Private Toilet Facility	91%	72%	88.7%
Roof Material			
Grass / Grass + Mud	34%	40%	46.5%

Iron Sheets	65%	60%	52.6%

[1] At the time of baseline data collection
[2] Government of Tanzania, 2012 Census, except where noted
[3] Government of Tanzania, 2007 Household Budget Survey

Table A3: Sample Size. Sample sizes for all HWTS across rounds are displayed along with the totals for each.

	Round 1	Round 2	Round 3	Round 4	**Total**
Siphon Filter	65	67	53	54	239
Pot Filter	71	66	58	58	253
Boiling	136	122	123	123	504
PUR	64	60	63	58	245
Takasa Maji	69	62	65	61	257
Waterguard Tablets	67	63	71	49	250
Waterguard Liquid	73	57	58	50	238
All HWTS	545	497	491	453	

Table A4: Schedule of Field Activities

	Round 1 HWTS Introduced	Round 1 HWTS Collected + Round 2 HWTS Introduced	Round 2 HWTS Collected + Round 3 HWTS Introduced	Round 3 HWTS Collected + Round 4 HWTS Introduced	Round 4 HWTS Collected + WTP Study Conducted
	2012				2013
Geita	5/4 - 5/17	6/13 - 7/5	7/15 8/15	11/17 - 12/14	1/6 - 1/17
Kisarawe	5/30 - 6/21	7/16 - 7/27	9/4 - 9/14	11/10 - 12/2	1/16 - 1/25

Figure A5: Results of the Discrete Choice Model. Disliked HWTS were considered as being ranked lower than a "none of the above" option. The characteristic of having high turbidity was interacted with all HWTS options, except for the Waterguard options, which were used as a reference for the effects of turbidity. The difference between rankings for households with high and low turbidity on the pot filter was not statistically significant; therefore in the final model 'high turbidity' was not interacted with the relative ranking of the pot filter.

Abbreviations: Takasa Maji (TM), PuR (PUR), Waterguard Liquid (WGL), Waterguard Tablets (WGT), Siphon Filter (SF), Pot Filter (PF)

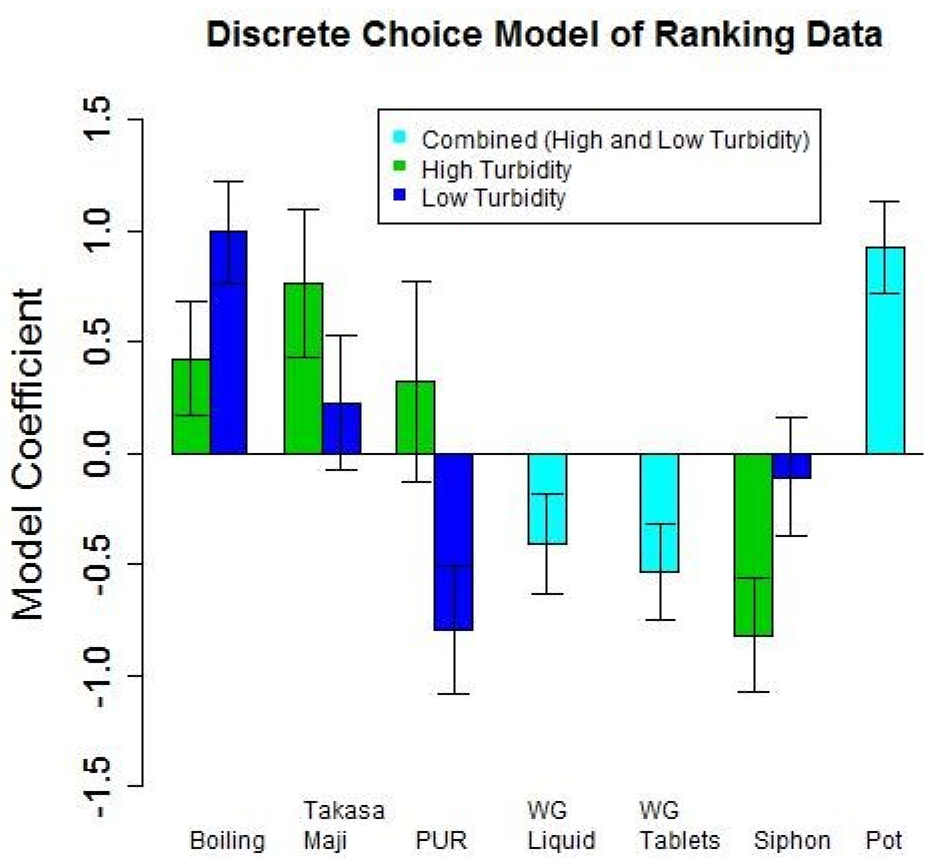


Figure A6: Information Pamphlets. Presented in Kiswahili, with a double-sided, tri-fold design, one was given to each household at the start of the first evaluation round.

1. Utangulizi

Watanzania walio wengi hasa waishio vijijini wanatumia maji toka vyanzo visivyosalama kama vile mabwawa, mito, malambo, vijito, na visima vilivyo wazi. Vyanzo hivi huchafuliwa kwa urahisi na kinyesi na taka za aina mbalimbali hivyo kuhatarisha afya za watumiaji. Wananchi walio wengi bado wanakunywa maji hayo bila kuyatibu.

Athari za kunywa maji yasiyotibiwa ni kuwepo kwa magonjwa ya kuhara yanayosababisha watu wengi kuugua na vifo kila mwaka, hasa kwa watoto chini ya miaka mitano na wanaoishi na virusi vya UKIMWI. Kutibu na kuhifadhi salama maji ya kunywa katika kaya ni njia madhubuti ya kukinga jamii dhidi ya magonjwa yanayoambukizwa kwa kunywa maji yasiyosalama.

Maji huchafuliwa kwa namna gani?

Maji yanaweza kuchafuliwa katika hatua mbalimbali, kuanzia kwenye vyanzo,

yanaposafirishwa, kutumiwa, au kutunzwa. Uchafuzi utokanao na vinyesi na taka zinazozalishwa na binaadamu ni wa hatari zaidi kwani hubeba vimelea vya magonjwa. Vyanzo vingine vya uchafuzi ni mifugo na wanyama pori.

Kutokuwa na choo bora, kutapisha vyoo, kujisaidia porini/mashambani, kuoga na kufua kando ya vyanzo vya maji huchangia uchafuzi wa vyanzo vya maji. Kinyesi cha binaadamu na uchafu mwingine huzolewa na kupelekwa katika vyanzo hivyo nyakati za mvua.

Maji pia huchafuliwa wakati wa kuchotwa, kusafirishwa, au yasipotunzwa vizuri majumbani. Uchafuzi huo huchangiwa na mikono michafu, vifaa vyenye uambukizo, mifugo, na usafi duni wa mazingira. Aidha, maji ya bomba yanaweza

2. Maji salama ni yapi?

Maji salama ni yale yasiyokuwa na hatari za kiafya kwa mwanadamu. Maji haya hayana vimelea vya magonjwa yoyote.

Watu wengi hudhani maji safi ni salama, lakini maji safi si lazima yawe salama. Wakati usafi wa maji huweza kuonekana kwa macho (maji kuwa meupe au maangavu), usalama wake unahakikishwa kwa kuyatibu tu. Kutibu maji huangamiza vimelea vya magonjwa, hivyo maji salama ni yale yaliyotibiwa kwa njia sahihi.

3. Kutibu maji ni nini?

Kutibu maji ya kunywa ni matumizi ya mbinu na vifaa ili kuyafanya maji kuwa salama kwa afya ya watumiaji. Kwa muda mrefu watu wamekuwa wakitumia njia mbalimbali katika kuboresha maji ya kunywa kama vile kuvundika, kuchuja kwa kitambaa, nk. Hata hivyo njia hizi hazitoshi kuyafanya maji kuwa salama.

Ili maji yawe salama, unahitaji kutumia njia zenye uwezo wa kuangamiza vijidudu hasa viletavyo maradhi. Njia hizi ni pamoja na kuchemsha, dawa aina ya Klorini (kama vile Waterguard), dawa zenye kutuamisha uchafu (mfano PUR), vichuja maji kama vile chujio la chungu, na sifoni, vichuja maji vya mchanga, na kadhalika. Mbinu hizi zimethibitishwa kitaalamu kuwa na uwezo wa kuboresha usalama wa maji, na zinatumika maeneo mengi ulimwenguni kote.

Faida za kutibu maji

- Tiba sahihi ya maji huangamiza vimelea vya magonjwa na kudhibiti maambukizi kupitia maji ya kunywa, hivyo kulinda afya ya watumiaji.
- Huboresha ladha, harufu, na kuleta mwonekano mzuri zaidi.
- Tiba ya maji pia humwondolea hofu mtumiaji na kumfanya ayafurahie maji anayoyatumia.

4. Njia za kutibu maji ni zipi?

Zipo njia mbalimbali za kutibu maji. Njia zilizothibitishwa kuwa na uwezo wa kutokomeza vimelea vya magonjwa ndizo njia bora kiafya. Zifuatazo ni baadhi ya njia bora za kutibu maji zinazopendekezwa na Shirika la Afya Duniani (WHO);

Njia bora za kutibu maji: Juu kushoto kuchemsha, juu kulia Klorini, Chini kushoto dawa ya kutuamisha uchafu, chini kulia kichuja maji cha udongo;

1. Kuchemsha,
2. Dawa aina ya Klorini (kama vile Waterguard),
3. Dawa zenye kutuamisha uchafu (kama vile PUR),
4. Vichuja maji vya udongo (kama vile chujio la chungu, na sifoni),
5. Vichuja maji vya vingine (kama vile chujio la mchanga, nyuzi, kaboni, na kadhalika.

Tibu maji na uyanywe bila hofu

5. Hifadhi Salama ya Maji ya Kunywa ni nini?

Hifadhi salama ya maji inalenga kulinda maji yaliyotibiwa yasichafuliwe upya kwa kuzuia namna zote za uchafuzi. Maji yaliyotibiwa yanaweza kuchafuliwa upya, hivyo ni muhimu kuyahifadhi maji kwa usahihi ili yaendelee kuwa salama kwa watumiaji.

Maji yaliyohifadhiwa yanaweza kuchafuliwa wakati wa kuchota au kuingiwa na uchafu toka mazingira ambayo chombo cha maji kimehifadhiwa. Ni muhimu wanakaya kuhifadhi maji katika hali ya usalama hata baada ya kuyatibu.

Jinsi ya kuhifadhi maji salama

Tumia chombo salama

Vyombo vya kawaida (mitungi, ndoo, na madumu) viwe na mfuniko ama mdomo mwembamba usioruhusu mikono na uchafu kuingia. Maji ya kunywa yachotwe bila kuguswa kwa mkono, kama vile kwa kupitia koki au kumiminwa tu.

Safisha chombo cha kuhifadhi maji

Osha chombo cha kuhifadhia maji ya kunywa mara kwa mara na kukiweka katika mazingira safi, mbali na wanyama, na uchafu wa aina nyingine. Weka chombo cha maji ya kunywa juu ya meza au stuli.

Dumisha usafi binafsi na usafi wa mazingira

Zingatia kanuni za unawaji mikono kwa sabuni nyakati muhimu (kabla ya kula, baada ya kutoka msalani, baada ya kumtawadha mtoto, na kabla ya kuandaa chakula), matumizi sahihi ya choo, kutumia kichanja cha vyombo, na kusafisha mazingira ya kaya.

Kuwa mfano, kunywa maji safi na salama

Kijarida hiki kimeandaliwa na

Mradi wa Maji Salama,
Taasisi ya Taifa ya Utafiti wa Magonjwa ya Binadamu (NIMR)
S.L.P 9653, Dar es Salaam
Simu: 022 2121400 Fax: 022 2121360
Tovuti: http://www.nimr.or.tz

Imeandaliwa kwa kushirikiana na Wizara ya Afya na Ustawi wa Jamii, na Chuo Kikuu cha Sayansi ya Tiba Muhimbili (MUHAS)

Taasisi ya Taifa ya Utafiti wa Magonjwa ya Binadamu (NIMR)

TIBA NA UHIFADHI SALAMA WA MAJI YA KUNYWA KATIKA NGAZI YA KAYA

Onyesha upendo kwa familia, wape maji salama

Figure A7: Dialogue Script. This sheet was given to each enumerator, in order to guide the dialogue that they initiated with each of their assigned households (translated from Swahili).

1. Invite anyone from the household who is interested in learning about drinking water and health to come have a discussion with you. Request to write down the names of all of the people who attend your discussion on your "HWTS Intro" sheet.
2. If they no longer wish to participate in the study, mark that on the sheet, thank them for their time and leave.
3. Discuss diarrhea and stomach problems
    a. Interaction with HH
        i. What is their experience? Their neighbors?
        ii. What do they think is the cause?
4. What are the water sources?
    a. Discuss source contamination, explain how contamination occurs.
        i. Open source
        ii. Open well
        iii. Protected well
        iv. borehole
5. Types of treatment available
    a. PUR
    b. Waterguard (liquid/tablets)
    c. Filter
    d. Boiling
6. Instruct them on how to use the HWTS that you have brought
    a. *Siphon Filter:* When you educate the head of the household, tell them that we will give them time to use the water filter, but they will need to return it to the research team at the end of the evaluation round. But later they will be given the opportunity to buy it if they so desire. Explain also that this does not include the bucket and stoves, as they will keep those for themselves as a gift.
    b. *Pot Filter:* Make sure that the pot filter container is clean before you give it to them. Request them to wash the filter once per week and boil the filter after 2 weeks. This is so that they can tell us if they had any difficulties with maintenance.
7. Tell them: "Get the advantage, treat your water"
8. Safe storage: Review the importance of a covered container and say "Store drinking water hygienically"
9. Hygiene and Sanitation
    a. Water drawing
    b. Hand washing
    c. Latrine usage
10. Tell them: "Be educated, treat and store your water safely, for your health" "Get the advantage, treat your water. "Get an advantage, treat your water."

Figure A8: HWTS Instructions. These were printed stickers measuring approximately 8.5 x 5.5 inches. A sticker was used during the training provided to the households at the start of each evaluation round. After the training, the sticker was fixed to their safe storage container. A different sticker was designed for each of the HWTS: the example shown below was for boiling. The translation from Swahili appears below the sticker.

Boiling

How to use

1. Place the pot with the water on the fire
2. Make sure the water is in a rolling boil.
3. The water should boil for 5 minutes
4. Take the pot off the fire and allow it to cool in a clean place.
5. Pour the water into a safe storage container.

Your water is now ready to drink

Get the advantage, treat your water

Table A9: Ratio of number of times one HWTS was chosen over the number of times a second HWTS was chosen (given that both had been won during the modified auction). This is a pairwise comparison of likelihood of purchase, when auctions for both HWTS were "won." HWTS were only available for purchase if the participant "won" their auction by providing a higher bid than the randomly chosen price. Each participant played the auction game one time for each of the HWTS that they evaluated, plus the Waterguard product that they did not evaluate (a total of four HWTS auctions). If they "won" more than one auction, then they were given the option to purchase more than one HWTS. Including only the instances where more than one auction was "won", the ratio presented here represents the number of times that a participant chose one HWTS divided by the number of times a participant chose the other HWTS. This comparison is useful for showing which HWTS was preferred among pairs of HWTS both of which were likely found to be desirable by the household.

		Ratio of Decision to Purchase (Denominator)					
		Takasa Maji	PUR	Waterguard Liquid	Waterguard Tablets	Siphon Filter	Pot Filter
Ratio of Decision to Purchase (Numerator)	Takasa Maji	1.00					
	PUR		1.00				
	Waterguard Liquid	1.10	1.23	1.00			
	Waterguard Tablets	0.87	1.00	0.93	1.00		
	Siphon Filter	2.00	1.42	1.32	1.25	1.00	
	Pot Filter	1.59	1.30	1.26	1.41		1.00

Table A10: The number of times that both HWTS were "won" by the same household.

	Takasa Maji	PUR	Waterguard Liquid	Waterguard Tablets	Siphon Filter	Pot Filter
Takasa Maji	66					
PUR	0	99				
Waterguard Liquid	44	72	200			
Waterguard Tablets	34	49	108	156		
Siphon Filter	5	21	35	25	54	
Pot Filter	27	42	70	66	0	157

Figure A11: Willingness to Pay. The cumulative share of participants who were willing to pay each bid is graphed below, along with the respective retail prices and median bids for each of the HWTS included in the study.

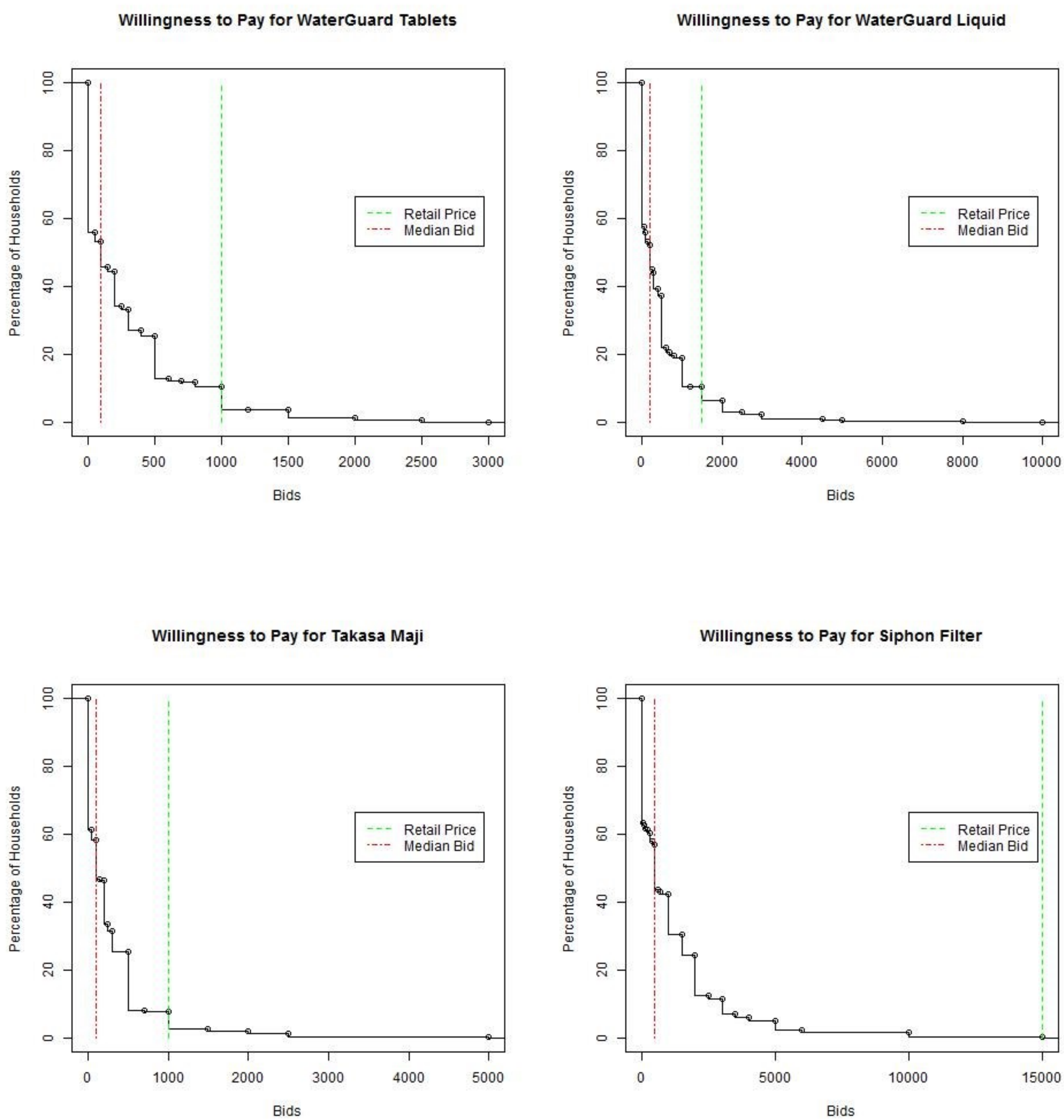


Figure A12: The annual subsidy needed to maintain coverage for 50% of the rural population (after national scale up has been achieved). These subsidy estimates do not take preferences into account; although they give a rough estimate of the subsidized price levels needed in order to achieve a demand sufficient to cover 50% of the rural population, such price levels would not ensure that the HWTS in question was used consistently and correctly. The rural population estimate[1] was multiplied by 50%, 2 liters/day/person, and by 365 days per year, to yield an estimated annual treated drinking water volume. For PuR, this volume was divided by the volume treated per packet (10 liters) to yield the annual units needed. For the Waterguard products, the annual units needed required an estimate of the volume of water which came from turbid sources; in our study, in round four, 42% of households were using a turbid source for their drinking water. Therefore, we estimated the annual treated drinking water from highly turbid sources and the annual treated drinking water from less turbid sources based on this percentage, and divided the former by 10 liters per tablet for Waterguard Tablets and 500 liters per bottle for Waterguard Liquid[2], while likewise dividing the latter by 20 liters per tablet and 1000 liters per bottle[2] as appropriate. For the durable HWTS (Siphon Filter and Pot Filter), we first multiplied the rural population estimate by 50%, then divided it by 5.3 people per household3, in order to estimate the number of rural households to be covered. We then calculated the initial investment needed in order to provide 50% of rural households with filters, as well as the annual replacement units needed, assuming an annual replacement rate of 22%. This rate was estimated for pot filters in Cambodia [4] and was assumed to be the same for siphon filters; if the actual replacement rate for siphon filters is lower, then the annual subsidy would be reduced proportionately. The initial investment for the filters was calculated by multiplying the estimated number of rural households by 50%, the price of a filter and the percentage of subsidy. The annual cost was calculated by multiplying the annual units needed for all five HWTS by their respective retail prices and the percentage of subsidy estimated to be necessary for each, to yield the annual cost for all five HWTS. This amount, as well as the initial investment amounts for the filters, was then divided by the National Health Budget for fiscal year 2013-2014, which was reported to be 1,498 billion TSh according to the national government of the United Republic of Tanzania.[5]

[1] JMP 2012
[2] PATH 2007
[3] National Bureau of Statistics, Ministry of Finance, Tanzania 2014
[4] Brown et al. 2009
[5] United Republic of Tanzania, Ministry of Finance

	Subsidy (%)	Annual Units Needed ('000)[1]	Annual Cost (million TSh)	% of National Health Budget[2]	Initial Investment (million Tsh)	% of National Health Budget[2]
Consumables						
PUR	80%	1,273,193	203,711	13.6%	-	-
Waterguard Liquid	87%	18,128	23,566	1.6%	-	-
Waterguard Tablets	90%	906,392	81,575	5.4%	-	-
Durables						
Siphon Filter	97%	708	10,272	0.7%	47,716	3.2%
Pot Filter	89%	708	28,338	1.9%	131,630	8.8%

[1] For JMP's 2012 rural population estimate
[2] For fiscal year 2013-2014

Appendix B: Survey Instrument Used in Hubli-Dharwad

Note: This survey was constructed for use in the evaluation of the impacts of continuous water supply in a mid-size city in southern India, called Hubli-Dharwad. This study will visit ~4000 households, 4 times each, over the course of 1 year. This survey was never meant to be implemented in paper format; instead it will be programmed into Android platform cell phones using Open Data Kit software. All "Notes" in italics are meant for the programmer only, and all un-italicized "Notes" are meant for the enumerators, and therefore should appear on the screen as written.

Questions highlighted in yellow, green and orange are to be asked only once, either in Round 1 (yellow highlights) or Round 2 (green highlights) or Round 3 (orange highlights). All other questions are to be repeated in each round.Purple font means that a new question was added in Round 2, blue font means that a new question was added in Round 3 and green font means that a new question was added in Round 4. Red font indicates that the question was repeated in multiple rounds because of data quality concerns.

Section 1. Questionnaire Identification upa bhaaga 1. prashnegala parichaya			
Variable Name	**Coding**	**Question**	**Answer**
a4hhid	input, integer <10000	1.1 Household ID 1.1 maneya gurutina sankhye	□□□□
a5studygrp	select1, string 1 2	1.2 Study group 1.2 study gumpu 24/7 Non-24/7	□
a6award	select1, string 8 9 10 11 14 16	1.2.2 Ward Number 1.2.2 ward sankhye 8 9 10 11 14	□□

	18 25 27 28 29 32 38 57 58 63	16 18 25 27 28 29 32 38 57 58 63	
a6cluster	input, integer	1.3 Cluster code 1.3 cluster sankhye	□□
a7enumerator	select1	1.4 Investigator Name 1.4 investigator hesaru Anasuya M. Drakshayani C. Neelama B. Parvati L. Shoba M. Rema P. Sneha N. Suma H. Sunanda B. Tejal G. Vijayalaxmi B. Supervisor	
a8watersample	select1, string 1 0	1.5 I will be taking a water sample at this household 1.5 nanu ee maneyinda neerannu parisilanege tegedukollabahude Yes No	□

b10live3yrs	select1, string 1 0	1.6 Have you lived in the neighborhood for the last 3 years? 1.6 kaleda mooru varshagalinda neevu ide staladalli vasisuttiddira? Yes No	□
b11cw5yrs	select1, string 1 0	1.7 Have you been using Corporation sweet water on a regular basis for the past 5 years? 1.7 kaleda aidu varshagalinda neevu Corporation sihi neerannu balasuttiddira? Yes No	□
(only in paper survey)	select1, string 1 0	1.8 Are you currently using corporation sweet water on a regular basis? 1.8 Yes No	□
Section 2. Respondent and household demographics **upa bhaaga 2. uttarisuvavara maneya hagu maneyalli vaasisuttiruva janara maahiti**			
b12pplhh	input, integer, <100	2.1 How many people in total live in your household at present? Note: Enter 99 if don't know 2.1 eega nimma maneyalli eshtu janaru vaasisuttare? tippani: gottilladiddare 99 antha bareyiri.	□□
b13fiveless	input, integer, <100	2.2 How many children five years old or younger live in your household at present? 2.2 eega nimma maneyalli aidu vayassina valage eshtu makkalu vaasisuttare?	□□
b14childcare	input, integer, <100	2.3 For how many of these children are you providing care at present? 2.3 eega avaralli eshtu makkalannu nivu kalaji maduttiddiri?	□□

b14zchildcarestill	string, select1 1 0	2.3.2 Are you still taking care of the following children? Note: Consult your household list for the names of the children. 2.3.2 neevu eavagalu saha ee makkalannu kalaji madutiddira? tippani: makkala hesarannu tiliyalu nimmage kottiruva kuatumbika mahitiyannu nodi. Yes No	☐
b15anewbaby	string, select1 1 0	2.3.3 Have you given birth or started to take care of any additional children five years old or younger since our last visit? 2.3.3 navu kaleda sala beeti nidida nanthara nimage bere magu huttideya athava bere vayassina athava aidu vayassigintha kelagina maguvannu neevu kalaji madutiddira? Yes No	☐
b15bchildcheck	string, trigger	*(Note: ODK will insert the number of children from 2.3 for confirmation.)* 2.3.4 Confirmation Screen: Currently, there are <**b14childcare**> children five years old or younger that the respondent is taking care of. 2.3.4. sariyagideya antha gamanisi: uttarisuvavaru eega kalaji maduva aidu vayassina athava aidu vayassigintha kelagina (**b14childcare**) makkalu.	
b15c1name	input, string	2.4 What is the name of the youngest child for whom you provide care? 2.4 ellariginta sanna maguvina hesarenu, yarannu nivu ati hechhagi kalaji madutiri?	
b16relationtoc1	select1, string	2.5 What is your relationship to (Child's Name)? 2.5 (magu) hagu nimagiruva sambhanda enu?	☐

	1 2 3 1 2 3	Mother Female regular caregiver Male regular caregiver amma poshane maduva hengasu poshane maduva gandasu	
b17agec1mom	input, integer, >16, <100	2.6 What is the age of (Child's Name)'s mother: (years) Note: Enter 99 if deceased. 2.6 (maguvina) taayiya vayassu esthu: (varshagalalli) tippani: maguvina taayi tirikondiddare 99 antha bareyiri.	□□
b18edc1mom	select1, string 1 2 3 4 5 6 7 8 9 10 11 99 1 2 3 4 5 6	2.7 What is the education level of (Child's Name)'s mother? 2.7 (maguvina) taayiya vidyarhate enu? No education Some primary school Completed primary school Some high school Completed high school PUC Technical Diploma/Certificate course Bachelor's Degree Masters degree (MSc, MBA, MCom, MA, MSW, MCA) Doctoral degree (PhD) Medical School (MBBS) Don't know odilla prathamika shale prathamika shale mugidide prouda shale prouda shale mugidide	□□

	7	P U C	
	8	diploma (ITI)	
	9	padaveedhara	
	10	melpadhaveedhara (MSc, MBA, MCom, MA, MSW, MCA)	
	11	doctorate padavi (PhD)	
	99	vaidyakeeye padavi (MBBS)	
		gottilla	
	select1, string	2.8 What is the education level of (Child's Name)'s father?	
		2.8 (maguvina) tandeya vidyarhate enu?	
	1		
	2	No education	
	3	Some primary school	
	4	Completed primary school	
	5	Some high school	
	6	Completed high school	
	7	PUC	
	8	Technical Diploma/Certificate course	
	9	Bachelor's Degree	
	10	Masters degree (MSc, MBA, MCom, MA, MSW, MCA)	
	11	Doctoral degree (PhD)	
b19edc1dad	99	Medical School (MBBS)	□□
		Don't know	
	1		
	2	odilla	
	3	prathamika shale	
	4	prathamika shale mugidide	
	5	prouda shale	
	6	prouda shale mugidide	
	7	P U C	
	8	diploma (ITI)	
	9	padaveedhara	
	10	melpadhaveedhara (MSc, MBA, MCom, MA, MSW, MCA)	
	11	doctorate padavi (PhD)	
	99	vaidyakeeye padavi (MBBS)	

		gottilla	
b20jobc1dad	select1, string	2.9 What is the main occupation of (Child's Name)'s father?	□□
		2.9 (maguvina) tandeya mukhya vrutti enu?	
	1		
	2	Day laborer	
	3	Auto driver	
	4	Street vendor	
	5	Owns a small business	
	6	Owns a large business	
	7	Government job	
	8	Private company job	
	9	Agriculture	
	10	NGO	
	11	Unemployed/ dead	
	12	Disabled	
	13	Retired, receiving pension	
	14	Retired, not receiving pension	
	99	Other	
		Don't know	
	1		
	2	dina kooli	
	3	auto chaalaka	
	4	beedigalalli vyaapara maaduvava	
	5	sanna vyaapara maaduvava	
	6	dodda vyaapara maaduvava	
	7	sarkarada naukari	
	8	khasagi naukari	
	9	besaya	
	10	NGO	
	11	kelasavillada /marana hondida	
	12	daurbalya	
	13	naukari inda nivrutti,viramavetana	
	14	naukari inda nivrutti,viramavetanavillada	
	99	itare	
		gotilla	

b21religionc1dad	select1, string 1 2 3 4 5 6 99 1 2 3 4 5 6 99	2.10 What is the religion of (Child's Name)'s father? 2.10 (maguvina) tande dharma yavudu? Hindu Muslim Christian Sikh Jain Other Refused to say Hindu Muslim Christian Sikh Jain itare helalu icchisalla	□□
b22castec1dad	input	2.11 What is (Child's Name)'s father's Caste name? Note: Enter 99 if don't know 2.11 (maguvina) tande yava jatige serirutare? tippani: gottilladiddare 99 antha bareyiri.	
Section 3. Information on children under the age of five **upa bhaaga 3. 5 varshadolagina maguvina bagge maahiti**			
(Note: Questions 3.2 – 3.12.3 should repeat for each of the children reported in 2.3)			
d01childstart		Note: Start from the youngest child. If more than 3 children under the age of 5 are present, then ask these questions of the 3 youngest children. tippani: maneyallina kiriya maguvininda shuru madona. 3 rakinta hecchu makkalu 5 varshadolage iddare, navu kiriya mooru makkala bagge prasnhe kelona.	

d09c1id **e09c2id** **f09c3id**	9 if N/A	*(Note: Automatically inserted by ODK)* 3.1 Child ID: 3.1 maguvina gurutina sankhye:	
e10c2name **f10c3name**	input string	*(Note: Should only appear for child number 2 and 3)* 3.2 What is the name of the youngest/second youngest/third youngest child? 3.2 ellakinta kiriya/eradane kiriya/ mooraneya kiriya maguvina hesarenu?	
d01childstart	input, string	Note: Start with the child with whom you started last time. tippani: kaleda sala tegedukonda modalane maguvininda shuru madona.	
d09c1idr2 **e09c2idr2** **f09c3idr2**	input, int <7	3.1 Child ID: 3.1 maguvina gurutina sankhye:	
B15C1Name **e10c2name** **f10c3name**	input string	*(Note: Should appear for all children)* 3.2 What is the name of the child? 3.2 maguvina hesarenu?	
d11c1sex **e11c2sex** **f11c3sex**	select1, string 1 2 1	3.3 What is (Child's Name)'s sex? 3.3 (maguvina hesaru)na linga yavudu? Male Female	□

	2	gandu hennu	
d12c1ageyear **e12c2ageyear** **f12c3ageyear**	input, integer, <5	3.4 What is his/her age in years and months? Now enter the year. 3.4 avana/avala vayassu eshtu? varshagalalli bareyiri.	□
d13c1agemonth **e13c2agemonth** **f13c3agemonth**	input, integer	3.4.1 Now enter the months. 3.4.1 tingalu bareyiri.	□□
d13c1birthday **e13c2birthday** **f13c3birthday**	input, integer	3.4.2 What was the exact date that (Child's Name) was born? Note: Enter the day here. Enter 99 if don't know. 3.4.2 tippani: gottilladiddare 99 antha bareyiri	□□
d13c1birthmonth **e13c2birthmonth** **f13c3birthmonth**	select1, string	3.4.3 Now enter the month. 1 5 9 2 6 10 3 7 11 4 8 12 Gotilla	□□
d13c1birthyear **e13c2birthyear** **f13c3birthyear**	select1, string 0 1 2	3.4.4 Now enter the year. 2011 2010	□□□□

	3 4 5 6 99	2009 2008 2007 2006 2005 gotilla	
d14c1bf **e14c2bf** **f14c3bf**	select1, string 1 0 99	*(Note: If 3.4 is < 3)* 3.5 Is (Child's Name) breast-fed currently? 3.5 (magu) ammana edehalu kudiyuttiddareye? Yes No (Skip to 3.7) DK (Skip to 3.7)	□□
d15c1bfplus **e15c2bfplus** **f15c3bfplus**	select1, string 1 0 99	*(Note: If 3.6 is 1)* 3.6 Does he/she take any water or food in addition to breast milk? 3.6 ede haalina jote neeru athava bere enadaru tinisu tinnutdeye? Yes No DK	□□
d16c1coughweek **e16c2coughweek** **f16c3coughweek**	select1, string 1 0 99	3.7 In the past week, has (**Child's name**) had a cough or cold? 3.7 kaleda elu divasagalalli (maguvina hesaru)ge tandi athava kemmu aagitta? Yes No (Skip to 3.8) DK (Skip to 3.8)	□□

d17ac1coughtoday **e17ac2coughtoday** **f17ac3coughtoday**	select1, string 1 0	*(Note: If 3.7(***d16c1coughweek***) is 1)* 3.7.0 Does he/she have symptoms today? 3.7.0 ivattu avanige/avalige ivugala lakshanagaliddave? Yes No	□
d17c1coughyest **e17c2coughyest** **f17c3coughyest**	select1, string 1 0	*(Note: If 3.7(***d16c1coughweek***) is 1)* 3.7.1 Did he/she have symptoms yesterday? 3.7.1 ninne avanige/avalige ivugala lakshanagaliddave? Yes No	□
d18c1coughyest2 **e18c2coughyest2** **f18c3coughyest2**	select1, string 1 0	*(Note: If 3.7(***d16c1coughweek***) is 1)* 3.7.2 Did he/she have symptoms the day before yesterday? 3.7.2 monne avanige/avalige ivugala lakshanagaliddave? Yes No	□
d19c1liquidweek **e19c2liquidweek**	select1, string	3.8 In the past week, has (**Child's name**) had liquid or watery stools looking like this? Note: Show Stool Chart	□□

f19c3liquidweek	 1 0 99	3.8 kaleda elu divasagalalli (maguvina hesaru) ega torisidante neerina reeti sandas madiddareye? <u>tippani: vivida prakarada sandasina chitragalannu torisi.</u> Yes No (Skip to 3.8.2) DK (Skip to 3.8.2)	
d20c1stools3liq **e20c2stools3liq** **f20c3stools3liq**	select1, string 1 0 99	*(Note: If 3.8 (**d19c1liquidweek**) is 1)* 3.8.1 During that time, did he/she have three or more stools per day? 3.8.1 aa samayadalli, avanu/avalu ondu dinakke mooru athava adakintha hechhu bari sandas madiddareye? Yes (Skip to 3.8.5) No DK	□□
d21c1softweek **e21c2softweek** **f21c3softweek**	select1, string 1 0 99	*(Note: If 3.8 (**d19c1liquidweek**) is NOT 1 OR 3.8.1 (**d20c1stools3liq**) is NOT 1)* 3.8.2 In the past week, has (<u>**Child's name**</u>) had soft stools looking like this? <u>Note: Show Stool Chart</u> 3.8.2 kaleda elu divasagalalli, (maguvina hesaru) ega torisidante mruduvada reeti sandas madiddareye? <u>tippani: vivida prakarada sandasina chitragalannu torisi.</u> Yes No (Skip to 3.9) DK (Skip to 3.9)	□□

d23c1stools3sa **e23c2stools3sa** **f23c3stools3sa**	select1, string 1 0 99	*(Note: If 3.8.2 (***d21c1softweek***) is 1)* 3.8.3 During that time, did he/she have three or more stools per day? 3.8.3 aa samayadalli, avanu/avalu ondu dinakke mooru athava adakintha hechhu bari sandas madiddareye? Yes No (Skip to 3.9) DK (Skip to 3.9)	□□
d22c1softacheweek **e22c2softacheweek** **f22c3softacheweek**	select1, string 1 0 99	*(Note: If 3.8.3 (***d23c1stools3sa)*** is 1)* 3.8.4 During that time, did (**Child's name**) also have a stomach ache? 3.8.4 aa samayadalli (maguvina hesaru)ge hotte novu enadaru bandideya? Yes No (Skip to 3.9) DK (Skip to 3.9)	□□
d24ac1symptoday **e24ac2symptoday** **f24ac3symptoday**	select1, string 1	*(Note: If 3.8.1 (***d20c1stools3liq)*** OR 3.8.4 (***d23c1stools3sa***) is 1)* 3.8.X Does he/she have symptoms today? 3.8.X ivattu avanige/avalige ivugala lakshanagaliddave? Yes	□

	0	No	
d24c1sympyest **e24c2sympyest** **f24c3sympyest**	select1, string 1 0	*(Note: If 3.8.1 (***d20c1stools3liq***) OR 3.8.3 (***d22c1softacheweek***) is 1)* 3.8.5 Did he/she have symptoms yesterday? 3.8.5 ninne avanige/avalige ivugala lakshanagaliddave? Yes No	☐
d25c1sympyest2 **e25c2sympyest2** **f25c3sympyest2**	select1, string 1 0	*(Note: If 3.8.1 (***d20c1stools3liq***) OR 3.8.3 (***d22c1softacheweek*** *) is 1)* 3.8.6 Did he/she have symptoms the day before yesterday? 3.8.6 monne avanige/avalige ivugala lakshanagaliddave? Yes No	☐
d26c1bloodweek **e26c2bloodweek** **f26c3bloodweek**	select1, string 1 0 99	3.9 In the past week, has (**Child's name**) had blood or mucus in the stool? 3.9 kaleda elu divasagalalli, (maguvina hesaru)ge sandasnalli rakta athava nore taraha kandu banditte? Yes No (Skip to 3.10) DK (Skip to 3.10)	☐☐
d27ac1bloodtoday	select1, string	*(Note: If 3.9 (***d26c1bloodweek***) is 1)*	☐

e27ac2bloodtoday **f27ac3bloodtoday**	 1 0	 3.9.0 Does he/she have symptoms today? 3.9.0 ivattu avanige/avalige ivugala lakshanagaliddave? Yes No	
d27c1bloodyest **e27c2bloodyest** **f27c3bloodyest**	select1, string 1 0	*(Note: If 3.9 (**d26c1bloodweek**) is 1)* 3.9.1 Did he/she have symptoms yesterday? 3.9.1 ninne avanige/avalige ivugala lakshanagaliddave? Yes No	□
d28c1bloodyest2 **d28c2bloodyest2** **f28c3bloodyest2**	select1, string 1 0	*(Note: If 3.9 (**d26c1bloodweek**) is 1)* 3.9.2 Did he/she have symptoms the day before yesterday? 3.9.2 monne avanige/avalige ivugala lakshanagaliddave? Yes No	□
d29c1vomitweek **e29c2vomitweek** **f29c3vomitweek**	select1, string 1	3.10 In the past week, has (**Child's name**) vomited? 3.10 kaleda elu divasagalalli, (maguvina hesaru)ge vanti agitta?	□□

	0 99	Yes (Skip to 3.10.3) No DK	
d30c1nausweek **e30c2nausweek** **f30c3nausweek**	select1, string 1 0 99	*(Note: If 3.10 (**d29c1vomitweek**) is NOT 1)* 3.10.1 In the past week, has (**<u>Child's name</u>**) had nausea? 3.10.1 kaleda elu divasagalalli, (maguvina hesaru)ge vanti banda hage enadaru agitta? Yes No (Skip to 3.11) DK (Skip to 3.11)	□□
d31c1nausstomweek **e31c2nausstomweek** **f31c3nausstomweek**	select1, string 1 0 99	*(Note: If 3.10.1 (**d30c1nausweek**) is 1)* 3.10.2 During that time, did (**<u>Child's name</u>**) also have stomach ache? 3.10.2 aa samayadalli, (maguvina hesaru)ge hotte novu enadaru bandideya? Yes No (Skip to 3.11) DK (Skip to 3.11)	□□
d32ac1nausstomtoda y **e32ac2nausstomtoday**	select1, string	*(Note: If 3.10 (**d29c1vomitweek**) is 1 OR 3.10.2 (**d31c1nausstomweek**) is 1)*	□

f32ac3nausstomtoday	1 0	3.10.X Does he/she have symptoms today? 3.10.X ivattu avanige/avalige ivugala lakshanagaliddave? Yes No	
d32c1stomachyest **e32c2stomachyest** **f32c3stomachyest**	select1, string 1 0	*(Note: If 3.10 (***d29c1vomitweek***) is 1 OR 3.10.2 (***d31c1nausstomweek***) is 1)* 3.10.3 Did he/she have symptoms yesterday? 3.10.3 ninne avanige/avalige ivugala lakshanagaliddave? Yes No	□
d33c1stomachyest2 **e33c2stomachyest2** **f33c3stomachyest2**	select1, string 1 0	*(Note: If 3.10 (***d29c1vomitweek***) is 1 OR 3.10.2 (***d31c1nausstomweek***) is 1)* 3.10.4 Did he/she have symptoms the day before yesterday? 3.10.4 monne avanige/avalige ivugala lakshanagaliddave? Yes No	□
d34c1cutsweek **e34c2cutsweek** **f34c3cutsweek**	select1, string 1	3.11 In the past week, has (**Child's name**) had any cuts or bruising? 3.11 kaleda elu divasagalalli (maguvina hesaru)ge enadaru gayagalu agitta?	□□

	0 99	Yes No (Skip to 3.12) DK (Skip to 3.12)	
d35ac1cutstoday **e35ac2cutstoday** **f35ac3cutstoday**	select1, string 1 0	*(Note: If 3.11 (***d34c1cutsweek)*** is 1)* 3.11.0 Does he/she have symptoms today? 3.11.0 ivattu avanige/avalige ivugala lakshanagaliddave? Yes No	
d35c1cutsyest **e35c2cutsyest** **f35c3cutsyest**	select1, string 1 0	*(Note: If 3.11 (***d34c1cutsweek)*** is 1)* 3.11.1 Did he/she have symptoms yesterday? 3.11.1 ninne avanige/avalige ivugala lakshanagaliddave? Yes No	
d36c1cutsyest2 **e36c2cutsyest2** **f36c3cutsyest2**	select1, string 1 0	*(Note: If 3.11 (***d34c1cutsweek)*** is 1)* 3.11.2 Did he/she have symptoms the day before yesterday? 3.11.2 monne avanige/avalige ivugala lakshanagaliddave? Yes No	
g10recoughweek	select1, string 1	3.12 In the past week, have you had a cough or cold? 3.12 kaleda elu divasagalalli nimage tandi athava kemmu aagitta?	

	0 99	Yes No (Skip to 3.12) DK (Skip to 3.12)	
G11aRECoughToday	select1, string 1 0	*(Note: If 3.12 (***g10recoughweek***) is 1)* 3.12.0 Do you have these symptoms today? 3.12.0 ivattu nimage ivugala lakshanagaliddave? Yes No	□
g11recoughyest	select1, string 1 0	*(Note: If 3.12 (***g10recoughweek***) is 1)* 3.12.1 Did you have these symptoms yesterday? 3.12.1 ninne nimage ivugala lakshanagaliddave? Yes No	□
g12recoughyest2	select1, string 1 0	*(Note: If 3.12 (***g10recoughweek***) is 1)* 3.12.2 Did you have these symptoms the day before yesterday? 3.12.2 monne nimageivugala lakshanagaliddave? Yes No	□
g13reliquidweek	select1, string 1 0 99	3.13 In the past week, have you had liquid or watery stools? 3.13 kaleda elu divasagalalli nimage neerina reeti sandas aagitta? Yes No (Skip to 3.13.2) DK (Skip to 3.13.2)	□□
g14restools3liq	select1, string	*(Note: If 3.13 (***g13reliquidweek***) is 1)*	□□

	      1 0 99	3.13.1 During that time, did you have three or more stools per day? 3.13.1 aa samayadalli,nimage ondu dinakke mooru athava adakintha hechhu bari sandas madiddira? Yes (Skip to 3.13.4) No DK	
g15resoftweek	select1, string 1 0 99	*(Note: If 3.13 (**g13reliquidweek**) is NOT 1 OR 3.13.1 (**g14restools3liq**) is NOT 1)* 3.13.2 In the past week, have you had soft stools? 3.13.2 kaleda elu divasagalalli, nimage mruduvada reeti sandas aagitta? Yes No (Skip to 3.14) DK (Skip to 3.14)	□□
g17restools3sa	select1, string 1 0 99	*(Note: If 3.13.2 (**g15resoftweek**) is 1)* 3.13.3 During that time, did you have three or more stools per day? 3.13.3 aa samayadalli ,nimage ondu dinakke mooru athava adakintha hechhu bari sandas aagitta? Yes No (Skip to 3.14) DK (Skip to 3.14)	□
g16resoftacheweek	select1, string 1	*(Note: If 3.13.3 (**g17restools3sa**) is 1)* 3.13.4 During that time, did you also have stomach ache? 3.13.4 aa samayadalli nimage hotte novu enadaru banditta?	□□

	0 99	Yes No (Skip to 3.14) DK (Skip to 3.14)	
g18aresymptoday	select1, string 1 0	*(Note: If 3.13.1 (**g14restools3liq**) OR 3.13.3 (**g17restools3sa**) is 1)* 3.13.X Do you have symptoms today? 3.13.X ivattu nimage ivugala lakshanagaliddave? Yes No	☐
g18resympyest	select1, string 1 0	*(Note: If 3.13.1 (**g14restools3liq**) OR 3.13.3 (**g17restools3sa**) is 1)* 3.13.5 Did you have symptoms yesterday? 3.13.5 ninne nimage ivugala lakshanagaliddave? Yes No	☐
g19resympyest2	select1, string 1 0	*(Note: If 3.13.1 (**g14restools3liq**) OR 3.13.3 (**g17restools3sa**) is 1)* 3.13.6 Did you have symptoms the day before yesterday? 3.13.6 monne nimage ivugala lakshanagaliddave? Yes No	☐
g20rebloodweek	select1, string 1 0 99	3.14 In the past week, have you had blood or mucus in the stool? 3.14 kaleda elu divasagalalli, nimage sandasnalli rakta athava nore taraha kandu banditte? Yes No (Skip to 3.15) DK (Skip to 3.15)	☐☐
g21arebloodtoday	select1, string	*(Note: If 3.14 (**g20rebloodweek**) is 1)*	☐

	1 0	3.14.0 Do you have these symptoms today? 3.14.0 ivattu nimage ivugala lakshanagaliddave? Yes No	
g21rebloodyest	select1, string 1 0	*(Note: If 3.14 (**g20rebloodweek**) is 1)* 3.14.1 Did you have symptoms yesterday? 3.14.1 ninne nimage ivugala lakshanagaliddave? Yes No	□
g22rebloodyest2	select1, string 1 0	*(Note: If 3.14 (**g20rebloodweek**) is 1)* 3.14.2 Did you have symptoms the day before yesterday? 3.14.2 monne nimage ivugala lakshanagaliddave? Yes No	□
g23revomitweek	select1, string 1 0 99	3.15 In the past week, have you vomited? 3.15 kaleda elu divasagalalli, nimage vanti agitta? Yes (Skip to 3.15.3) No DK	□□
g24renausweek	select1, string 1 0	*(Note: If 3.15 (**g23revomitweek**) is NOT 1)* 3.15.1 In the past week, have you had nausea? 3.15.1 kaleda elu divasagalalli, nimage vanti banda hage enadaru agitta? Yes	□□

	99	No (Skip to 3.16) DK (Skip to 3.16)	
g25renausstomweek	select1, string 1 0 99	*(Note: If 3.15.1 (**g25renausstomweek**) is 1)* 3.15.2 During that time, did you also have stomach ache? 3.15.2 aa samayadalli nimage hotte novu enadaru banditta? Yes No (Skip to 3.16) DK (Skip to 3.16)	□□
g26arestomachyest	select1, string 1 0	*(Note: If 3.15 (**g23revomitweek**) is 1 OR 3.15.2 (**g25renausstomweek**) is 1)* 3.15.X Do you have these symptoms today? 3.15.X ivattu nimage ivugala lakshanagaliddave? Yes No	□
g26restomachyest	select1, string 1 0	*(Note: If 3.15 (**g23revomitweek**) is 1 OR 3.15.2 (**g25renausstomweek**) is 1)* 3.15.3 Did you have symptoms yesterday? 3.15.3 ninne nimage ivugala lakshanagaliddave? Yes No	□
g27restomachyest2	select1, string 1 0	*(Note: If 3.15 (**g23revomitweek**) is 1 OR 3.15.2 (**g25renausstomweek**) is 1)* 3.15.4 Did you have symptoms the day before yesterday? 3.15.4 monne nimage ivugala lakshanagaliddave? Yes No	□

g28recutsweek	select1, string 1 0 99	3.16 In the past week, have you had any cuts or bruising? 3.16 kaleda elu divasagalalli, nimage enadaru gayagalu agitta? Yes No (Skip to 3.17) DK (Skip to 3.17)	☐☐
g29arecutsyest	select1, string 1 0	*(Note: If 3.16 (**g28recutsweek**) is 1)* 3.16.0 Do you have these symptoms today? 3.16.0 ivattu nimage ivugala lakshanagaliddave? Yes No	☐
g29recutsyest	select1, string 1 0	*(Note: If 3.16 (**g28recutsweek**) is 1)* 3.16.1 Did you have symptoms yesterday? 3.16.1 ninne nimage ivugala lakshanagaliddave? Yes No	☐
g30recutsyest2	select1, string 1 0	*(Note: If 3.16 (**g28recutsweek**) is 1)* 3.16.2 Did you have symptoms the day before yesterday? 3.16.2 monne nimage ivugala lakshanagaliddave? Yes No	☐
h10doctorweek	select1, string	3.17 In the past week, did anyone in your family go to the doctor?	☐

	1 0 99	3.17 kaleda elu divasagalalli nimma kutumbadavaralli yaradaru vaidyara bali hogiddira? Yes No (Skip to 3.18) DK	
h11doctorcost	input, integer, <100000	*(Note: If 3.17 is 1)* 3.17.1 How much was paid in total for the doctor's visit (procedures, fees, or testing)? (Ru.) Note: Enter 99 if don't know. 3.17.1 vaidyarrannu bheti madidaga eshtu shulka/rokka kottiddiri (rasidi padeyudu, vaidyara sulka, parisheelane)? (ru.) tippani: gottilladiddare 99 antha bareyiri	□□□□□
h11adoctorhcgi	input, integer, <100000	*(Note: If 3.17 is 1)* 3.17.2 If any of this cost was because of diarrhea, vomiting, nausea or stomache ache, how much of this total amount was spent for these? (Ru.) Note: Enter 99 if don't know. 3.17.2 ottu vechha madida hanadalli atisara, vanti, vanti banda hage athava hotte novu evugalige madida vechha estu? (Ru.) tippani: gottilladiddare 99 antha bareyiri	□□□□□
h12medicine	select1, string 1 0 99	3.18 In the last week did anyone in your family buy medicine? 3.18 kaleda elu divasagalalli nimma kutumbadalli yaradaru oushadhavannu kharidisiddira? Yes No (Skip to 3.19) DK	□

h13medicinecost	input, integer, <100000	*(Note: If 3.18 is 1)* 3.18.1 How much did you pay total for medicine? Note: Enter 99 if don't know. 3.18.1 oshdhiyannu kharidisisalu esthu veccha madiddiri? (ru.) tippani: gottilladiddare 99 antha bareyiri	□□□□□
h13amedicinehcgi	input, integer, <100000	*(Note: If 3.18 is 1)* 3.18.2 If any of this cost was because of diarrhea, vomiting, nausea or stomache ache, how much of this total amount was spent for these? (Ru.) Note: Enter 99 if don't know. 3.18.2 ottu vechha madida hanadalli atisara, vanti, vanti banda hage athava hotte novu evugalige madida vechha eshtu? (Ru.) tippani: gottilladiddare 99 antha bareyiri	□□□□□
h14losework	select1, string 1 0 99	3.19 In the last week, did anyone in your family lose paid work time, either to care for a sick family member or because they were sick themselves? 3.19 kaleda elu divasagalalli, nimma kutumbadaalli yaradaru, arogya samasyindagi atava aaramavilladavarannu kalajimaduva saluvagi kelasakke hogade iddidira? Yes No (Skip to 3.20) DK	□□
h15loseworknum	input, integer, <100	*(Note: If 3.19 is 1)* 3.19.1 How many members? Note: Enter 99 if don't know.	□□

		3.19.1 eshtu sadasyaru? tippani: gottilladiddare 99 antha bareyiri	
h16loseworkhours	input, integer, <168	*(Note: If 3.19 is 1)* 3.19.2 How many hours? (hours) Note: Enter 99 if don't know. 3.19.2 eshtu taasu? (taasu) tippani: gottilladiddare 99 antha bareyiri	□□□
h17losechores	select1, string 1 0 99	3.20 In the last week, did anyone in your family take time away from unpaid household chores, either to care for a sick family member or because they were sick themselves? 3.20 kaleda elu divasagalalli, nimma kutumbadalli yarigadaru anaroogyadinda kalajimaduva saluvagi atava nimma anaroogyadinda mane kelasvannu madade iddidira? Yes No (Skip to 3.21) DK	□□
h18losechoresnum	input, integer, <100	*(Note: If 3.20 is 1)* 3.20.1 How many members? Note: Enter 99 if don't know. 3.20.1 eshtu sadasyaru? tippani: gottilladiddare 99 antha bareyiri	□□
h19losechoreshours	input, integer, <100	*(Note: If 3.20 is 1)* 3.20.2 How many hours? (hours) Note: Enter 99 if don't know.	□□

		3.20.2 eshtu taasu? (taasu) tippani: gottilladiddare 99 antha bareyiri	
h20losestudent	select1, string 1 0 99	3.21 In the past week, did any students miss a school day,either to care for a sick family member or because they were sick themselves? 3.21 kaleda elu divasagalalli shalege hoguva makkalu tamage aramillade athava meneyalli yaradaru aramilladakkagi shale tappissiddu ideye? Yes No (Skip to 3.22) DK	□□
h21losestudentnum	input, integer, <100	*(Note: If 3.21 is 1)* 3.21.1 How many members? Note: Enter 99 if don't know. 3.21.1 eshtu sadasyaru? tippani: gottilladiddare 99 antha bareyiri	□□
h22losestudentdays	input, integer, <100	*(Note: If 3.21 is 1)* 3.21.2 How many days? (days) Note: Enter 99 if don't know. 3.21.2 eshtu divasa? (divasagalu) tippani: gottilladiddare 99 antha bareyiri	□□
h23typhoid	select1, string	3.22 In the last three years, did anyone in your household have typhoid? 3.22 kaleda 3 varshagalalli nimma maneyalli yaarigadaru typhoid aagitta?	□

	1 0	Yes No (Skip to 3.23)	
h24typhoidtimes	input, integer <100	*(Note: If 3.22 (**h23typhoid**) is 1)* 3.22.1 How many times? 3.22.1 eshtu baari?	□
H24atyphoidmembers1	input, integer <100	3.22.2 How many members the first time? 3.22.2 Modalane baari, esthu sadasyarige?	□
H24btyphoidmembers2	input, integer <100	3.22.3 How many members the second time? 3.22.3 Eradane baari, esthu sadasyarige?	□
H24ctyphoidmembers3	input, integer <100	3.22.4 How many members the third time? 3.22.4 Moorane baari, esthu sadasyarige?	□
h25typhoidcost	input, integer, <100000	*(Note: If 3.22 (**h23typhoid**) is 1)* 3.22.5 How much was paid in total for medical treatment (procedures, fees, testing and medicine)? Note: Enter 99 if don't know 3.22.5 ottu eshtu hanavannu oshdha chikishyegagi vechha madiddiri? tippani: gottilladiddare 99 antha bareyiri	□□□□□
h26cholera	select1, string 1 0	3.23 In the last three years, did anyone in your household have cholera? 3.23 kaleda 3 varshagalalli nimma maneyalli yaarigadaru cholera aagitta? Yes No (Skip to 3.24)	□
h27choleratimes	input, integer	*(Note: If 3.23 (**h26cholera**) is 1)*	□

	<100	3.23.1 How many times? 3.23.1 eshtu baari?	
H27acholeramembers1	input, integer <100	3.23.2 How many members? 3.23.2 esthu sadasyarige?	□
H27bcholeramembers2	input, integer <100	3.23.3 How many members the second time? 3.23.3 Eradane baari, esthu sadasyarige?	□
H27ccholeramembers3	input, integer <100	3.23.4 How many members the third time? 3.23.4 Moorane baari, esthu sadasyarige?	□
h28choleracost	input, integer, <100000	*(Note: If 3.23 (***h26cholera***) is 1)* 3.23.5 How much was paid in total for medical treatment (procedures, fees, testing and medicine)? Note: Enter 99 if don't know 3.23.5 ottu eshtu hanavannu oshdha chikishyegagi vechha madiddiri? tippani: gottilladiddare 99 antha bareyiri	□□□□□
h29jaundice	select1, string	3.24 In the last three years, did anyone in your household have jaundice? 3.24 kaleda 3 varshagalalli nimma maneyalli yaarigadaru jaundice aagitta?	□
	1	Yes	
	0	No (Skip to 3.25)	
h30jaundicetimes	input, integer <100	*(Note: If 3.24 (***h29jaundice***) is 1)* 3.24.1 How many times? 3.24.1 eshtu baari?	□
H30ajaundicemembers1	input, integer	3.24.2 How many members? 3.24.2 esthu sadasyarige?	□

	<100		
H30bjaundicemembers2	input, integer <100	3.24.3 How many members the second time? 3.24.3 Eradane baari, esthu sadasyarige?	□
H30cjaundicemembers3	input, integer <100	3.24.4 How many members the third time? 3.24.4 Moorane baari, esthu sadasyarige?	□
h31jaundicecost	input, integer, <100000	*(Note: If 3.24 (**h29jaundice**) is 1)* 3.24.5 How much was paid in total for medical treatment (procedures, fees, testing and medicine)? Note: Enter 99 if don't know 3.24.5 ottu eshtu hanavannu oshdha chikishyegagi vechha madiddiri? tippani: gottilladiddare 99 antha bareyiri	□□□□□
h32losechild	select1, string 1 0	3.25 In the last three years, did you lose any children under the age of 2? 3.25 kaleda 3 varshagallalli neevu erdu varshada athava erdu varshkinta valagina makkalannu kaleduondiddira? Yes No (Skip to Section 4)	□
h33losechildno	input, integer, <100	*(Note: If **h32losechild** is 1)* 3.25.1 How many children did you lose? 3.25.1 eshtu makkalannu kaledukondiddiri?	□
Section 4: Obtaining Water **upa bhaaga 4: neerina saulabya**			
4.1 Corporation Sweet Water **4.1 Corporation sihi neeru**			
i10cwfromwhere		4.1.1 From where do you collect Corporation sweet water?	

	  own neigh landlord public own neigh landlord public	4.1.1 Corporation sihi neeru nimage elli doreyuttade? Own connection Neighbor’s connection Landlord’s connection Public connection swanta nala akka pakkadavara nala malikar nala sarvajanika nala	
i11cwwhereb4	select1, string 1 0 99	*(Note for Round 2: In 24/7 only)* 4.1.2 Did you have your own connection before 24/7 came? 4.1.2 24/7 neeru sarabarajina munche nimmade ada nala iddita? Yes No DK	□□
i11cwwhereb4	select1, string 1 0 99	*(Note: In 24/7 only, if 4.1.1 is 1)* 4.1.2 Did you have your own connection before 24/7 came? 4.1.2 24/7 neeru sarabarajina munche nimmade ada nala iddita? Yes No DK	□□
i12cwshare	input, integer, <100	4.1.3 How many households share this connection? Note: Enter 99 if don’t know 4.1.3 eshtu kutumbagalu ide nalavannu hanchikondiddeeri? tippani: gottilladiddare 99 antha bareyiri.	□□

i13cwplussalt	select1, string 1 0 99	*(Note: In non-24/7 only)* 4.1.4 In addition to your sweet water, do you regularly receive salty Corporation water through the same connection? 4.1.4 sihi neerannu bittu,nimma naladalli Corporation uppina neeru baruttadeye? Yes No DK	□□
i14cwplussaltwhat	select1, string 1 2 3 99 1 2 3 99	*(Note: If 4.1.4 is 1)* 4.1.5 Do you know what kind of water this is (borewell or Neersagar)? 4.1.5 ee neeru yava mooladinda barutide endu nimage tilidideye (kolavebhavi or Neersagar)? Borewell water Neersagar water Corporation water that is not good Don't know kolavebhavi neerasagar corporation neeru sariyagilla (raadi) gotilla	
i14sweetonly	trigger. string	*(Note: In non-24/7 only* AND i13cwplussalt = 1) 4.1.5 For the next questions I will ask about Corporation piped sweet water only. 4.1.5 mundina prashnegalu Corporation sihi neerige matra sambandisiruttave	
i15cwquality	select1, string	4.1.6 In the last month, did your Corporation water ever smell, or look red or brown (dirty)?	□□

		4.1.6 kaleda ondu tingalalli nimma Corporation neeru yavagaladaru vasane, kempu atava kandu (raadi) bannadalli banditta?	
	1	Yes	
	0	No	
	2	Only at the start	
	99	Don't know	
	1	haudu	
	0	illa	
	2	shuru aguvaga	
	99	gottilla	
i16cw247freq	select1, string	*(Note: In 24/7 only)* 4.1.7 Before 24/7, how often did you receive Corporation piped sweet water? 4.1.7 24/7 neeru sarabarajina modalu nimage eshtu divasakomme Corporation neeru dorakuttittu?	□□
	1		
	2	24 hours everyday	
	3	Once everyday	
	4	Every 2 days	
	5	3-5 days	
	99	6 or more days	
		Don't know	
	1		
	2	pratidina, 24 ghante	
	3	divasakkomme	
	4	prati eradu divasakkomme	
	5	3-5 divasagalu	
	99	6 athava hechhina divasagalu	
		gottilla	
i17cw247int	select1, string	*(Note: In 24/7 only)* 4.1.8 In the last month, how many times did you have intermittencies in water service?	□□

	  0 1 2 3 99 0 1 2 3 99	4.1.8 kaleda ondu tingalalli,neeru sarabarajinalli eshtu eru peru kandittu? None (Skip to 4.1.10) Once Twice Three or more times Don't know 0 sala (Skip to 4.1.10) 1 sala 2 sala 3 athava adakintha hechhu sala Gotilla	
i18cw247inttime	select1, string 0 1 6 12 24 99 0 1 6 12 24 99	*(Note: In 24/7 only and if 4.1.8 is NOT 0)* 4.1.9 Last time that happened, for how long was the water off? 4.1.9 kaleda bari idu aadaga eshtu ghantegalu neeru baralilla? Less than 1 hour 1-6 hours 6-12 hours 12-24 hours More than 24 hours Don't know 1 ghante ginta kammi 1-6 ghante 6-12 ghante 12-24 ghante 24 ghante ginta hechhu Gotilla	□□
i19cwfreqlast	select1, string	*(Note: In non-24/7 only)*	□□

		4.1.10 Today is ____________ On what day did the water last come? 4.1.10 evattina divasa ____________ kaledabari neeru yendu bandittu?	
		Today……………………….…0 Last Wednesday………..…6 Tuesday before last…....12 Yesterday……………………..1 Last Thursday ……….…....7 Wednesday before last ..13 The day before yesterday…..2 Last Friday………….………8 Thursday before last …..14 Last Sunday……….…………3 Last Saturday……….……..9 Friday before last……....15 Last Monday……….………..4 Sunday before last……....10 Saturday before last……16 Last Tuesday……...…..……..5 Monday before last………11 Don't know……….…..…99	
		Ivattu……………………….…0 Kaleda Budhavara ……….6 Achhe Mangalavara………12 Ninne………………………..1 Kaleda Guruvara……….....7 Achhe Bhudavara ………..13 Monne……………………....2 Kaleda Shukravara …..….8 Achhe Guruvara ....…14 Kaleda Ravivara……………...3 Kaleda Shanivara……...…9 Achhe Shukravara………...15 Kaleda Somavara…….……...4 Achhe Ravivara ………...10 Achhe Shanivara…………16 Kaleda Mangalavara………..5 Achhe Somavara………..11 Gottilla………..…………….99	
i19cwfreqlast	select1, string	*(Note: In non-24/7 only)* 4.1.11 When do you expect it to come again? 4.1.11 matte yavaga neeru barabahudu?	□□
		Today………………..……0 This Wednesday………...6 Next Tuesday…………..…12 Tomorrow…………………1 This Thursday …………...7 Next Wednesday…………13 The day after tomorrow…2 This Friday……….………8 Next Thursday…………..…14 This Sunday……….……..3 This Saturday…..……..…9 Next	

		Friday………………….15 This Monday……….…….4 Next Sunday…………….10 Next Saturday……..……...16 This Tuesday……………5 Next Monday…………….11 Don't know……..…………..99	
		Ivattu……………………….…0 Ee Budhavara ………..….6 Mundina Mangalavara…….12 Ninne ……………………….....1 Ee Guruvara……………....7 Mundina Bhudavara ………13 Monne ………………………..2 Ee Shukravara ………..…8 Mundina Guruvara ...……...14 Nale…………………………..1 Ee Shanivara ……………9 Mundina Shukravara………15 Nadiddu……………………...2 Mundina Ravivara ……..10 Mundina Shanivara……….16 Ee Ravivara…………………3 Mundina Somavara…….11 Gottilla………..……………..99 Ee Somavara……………….....4 Ee Mangalavara……………..5	
i21cwhours	input, decimal	*(Note: In non-24/7 only)* 4.1.12 Last time the water came, for how many hours was it on? (hours) Note: Enter average of two numbers if a range is given. For example, if 2-3 hours is given, then put 2.5 hours. Enter 99 if don't know. 4.1.12 koneyasala neeru bandaga eshtu ghantegala varege neeru ittu? (ghante) tippani: earadu sankhye helidare sarasariyalli bareyiri udaharanege 2 rinda 3 ghante andare 2.5 ghante antha bareyiri, gottilladiddare 99 antha bareyiri.	□□.□
i22cwtime	select, integer	*(Note: In non-24/7 only)* 4.1.13 At what time did it start? (time)	□□:□□

		Note: Enter 99 if don't know 4.1.13 yava samayakke adu baralu shuruvaitu? (samaya) tippani: gottilladiddare 99 antha bareyiri.	
i23cwtimeunits	select1, integer 1 2	*(Note: In non-24/7 only)* 4.1.13.1 Was this in: 4.1.13.1 neeru beligge atava madyana banditta? AM PM	□
i22cwtime	select, integer	*(Note: In non-24/7and if 4.1.10 is 0, 1 or 2 only)* 4.1.13 At what time did it start? (time) Note: Enter 99 if don't know 4.1.13 yava samayakke adu baralu shuruvaitu? (samaya) tippani: gottilladiddare 99 antha bareyiri.	□□:□□
i23cwtimeunits	select1, integer 1 2	*(Note: In non-24/7 only)* 4.1.13.1 Was this in: 4.1.13.1 neeru beligge atava madyana banditta? AM PM	□
i24cwtimeusual	select1, string 1	*(Note: In non-24/7 only)* 4.1.14 Does the water always come at the same hour? 4.1.14 neeru yavagalu ide samayakke baruttadeya?	□□

	0 99	Yes (Skip to 4.1.16) No DK	
i25cwwait	input, decimal	*(Note: In non 24/7 only and 4.1.14 is NOT 1)* 4.1.15 How many hours do you usually wait for the water to come? Note: Enter average of two numbers if a range is given. For example, if 2-3 hours is given, then put 2.5 hours. Enter 99 if don't know. 4.1.15 samanyavagi neevu neerigagi eshtu samaya kayuviri? tippani: earadu sankhye helidare sarasariyalli bareyiri. udaharanege 2 rinda 3 ghante andare 2.5 ghante antha bareyiri, gottilladiddare 99 antha bareyiri.	□□.□
i26cwunexpect	select1, string	*(Note: In non 24/7 only)* 4.1.16.1 Last time the water came, did it come on the day you expected? 4.1.16.1 Kaleda sala neeru bandaga, neevu nirikshisida dinakke banditta? Yes (Skip to 4.1.16) No DK	□□
i26cwunexpect	input, decimal	*(Note: In non 24/7 only)* 4.1.16 In the last month, how many times did the water not come on the day you expected? Note: Enter average of two numbers if a range is given. For example, if 2-3 times is given, then put 2.5 times. Enter 99 if don't know. 4.1.16 kaleda ondu tingalalli, eshtu sala neevu neerikshisida samayakke neerigagi kadiddiri?	□□.□

		tippani: earadu sankhye helidare sarasariyalli bareyiri. udaharanege 2 rinda 3 sala andare 2.5 sala antha bareyiri, gottilladiddare 99 antha bareyiri.	
i27cwdayslate	input, decimal	*(Note: In non 24/7 only and if 4.1.6 is NOT 0)* 4.1.17 How many days later did the water come? Note: Enter average of two numbers if a range is given. For example, if 2-3 days is given, then put 2.5 days. Enter 99 if don't know. 4.1.17 eshtu divasada nantara neeru bantu? tippani: earadu sankhye helidare sarasariyalli bareyiri. udaharanege 2 rinda 3 divasa andare 2.5 divasa antha bareyiri, gottilladiddare 99 antha bareyiri.	□□.□
i28cwmissact	select1, string 1 0 99	*(Note: In non 24/7 only)* 4.1.18 Last time the water was late, did you miss social, religious, civic or leisure activities in order to wait for the water? 4.1.18 koneyadagi neeru tadavagi bandaga, neevu samagika, dharmika, paurasambhandhita yavudadaru chatuvatikegalannu tappisikondiddira? Yes No DK	□□
i28d247know	select1, string	*(Note: In 24/7 only)* 4.1.19 Were you aware that your house will be covered under 24x7 before you started getting 24 hours water supply? 4.1.19 nimma manege 24x7 neeru baruva modalu, nimage nimma mane 24x7 yojane adiyalli baruvadendu tiliditta?	□

	1 0	Yes No	
i28d247who	select1, string 1 2 3 4 5 6 1 2 3 4 5 6	*(Note: If 4.1.19 is 1)* 4.1.20 Who informed you? Corporator Officials of Water Supply Board Community leader Waterman Neighbour Others (Specify) corporator jala mandaliya adikarigalu samudayada mukhastaru neeru biduvavanu akka-pakkadavaru itare (namoodisiri)	
i28d247whosp	input, string	*(Note: If 4.1.20 is 6)* 4.1.21 Specify 4.1.21 namoodisiri	
i28d247prefer	select1, string 1 2	*(Note: In 24/7 only)* 4.1.22 Do you prefer water once in four days or 24 hours? 4.1.22 nimage 4 divasakke vamme baruva neeru, athava 24 ghante neeru ee eradaralli yavudu uttama annisuttade? Once in four days 24 hours	

	1 2	4 divasakke vamme 24 ghante	
i28d247preferwhy	select1, string 1 2 1 2	*(Note: If 4.1.22 is 1)* 4.1.23 Why? 4.1.23 yake endu namoodisi? We cannot pay the bill Others (specify) namage astondu hana pavatisalu sadyavaguttilla itare (namoodisiri)	
	input, string	*(Note: If 4.1.23 is 2)* 4.1.24 Specify 4.1.24 namoodisiri	
4.2 Paying for Corporation Sweet Water **4.2 Corporation sihi neerigagi hanavannu sallisuvudu**			
i29cwbill	select1, string 1 0 99	*(Note: If 4.1.1 is own, land or neigh)* 4.2.1 Do you, a landlord, or anyone else receive a bill for your Corporation sweet water? 4.2.1 neevu, nimma mane malikaru athava bereyaradaru Corporation sihi neerigagi bill padeyuttiddira? Yes (Skip to 4.2.3) No DK	□□
i30cwpay	select1, string	*(Note: If 4.2.1 is NOT 1)* 4.2.2 Do you pay anything for your Corporation sweet water?	□□

	1 0 99	4.2.2 neevu nimma corporation sihi neerigagi eshtu hanavannu koduttiddira? Yes (Skip to 4.2.11) No (Skip to 4.3) DK (Skip to 4.3)	
i31cwbillcxns	select1, string 1 2 3 1 2 3	*(Note: If 4.2.1 is 1)* 4.2.3 How many corporation connections are used by your family? Note: Consider the connections used in that particular home only. 4.2.3 neevu eshtu corporation nalagalannu hondiddiri? tippani: aa nalavu upayogisuttidda manege matra simitavagirabeku. 1 connection 2 connections More than 2 connections 1 nala 2 nala 2 nalagalginta hechhu	□
i32cwbillsee	select1, string 1 0	4.2.4 Can I see your most recent bill(s)? 4.2.4 nanu nimma ittichina billannu nodabahuda? Yes No	□
Note: Questions 4.2.5 – 4.2.10 should repeat a second time if "2 connections" or "more than 2 connections" were reported in 4.2.3			
i33arrnum **i39arrnum2**	input, integer	4.2.5.1 Enter the R.R. number (for the second connection) Note: Enter 99 if don't know	□□□□

		4.2.5.1 (eradaneya nala) R.R. sankeyannu dhakalisi: tippani: gottilladiddare 99 antha bareyiri.	
i33cwbillcharge1 **i39cwbillcharge2**	input, integer, <10000	4.2.5.2 Enter the water charges amount (for the second connection) (Ru.) Note: Enter 99 if don’t know 4.2.5.2 (eradaneya nala) neerina shulka dhakalisi (ru.) tippani: gottilladiddare 99 antha bareyiri.	□□□□
i34cwbillcapital1 **i40cwbillcapital2**	input, integer, <100	4.2.6 Enter the capital recovery charge (for the second connection) (Ru.) Note: Enter 99 if don’t know 4.2.6 (eradaneya nala) bandavala hoodikeya sheva shulka dhakalisi (ru.) tippani: gottilladiddare 99 antha bareyiri.	□□
i35cwbillarrears1 **i41cwbillarrears2**	input, integer, <1,000,000	4.2.7 Enter the arrears owed (for the second connection) (Ru.) Note: Enter 99 if don’t know 4.2.7 (eradaneya nala) baki tumbuva hanavannu dhakalisi (ru.) tippani: gottilladiddare 99 antha bareyiri.	□□□□□□
i36cwbillinterest1 **i42cwbillinterest2**	input, integer, <100,000	4.2.8 Enter the interest charged on arrears owed (for the second connection) (Ru.) Note: Enter 99 if don’t know 4.2.8 (eradaneya nala) baki hanada mele iruva baddiyannu dhakalisi (ru.) tippani: gottilladiddare 99 antha bareyiri.	□□□

i37cwbillvolume1 **i43cwbillvolume2**	input, integer, <1,000,000	4.2.9 Enter the volume of water used (for the second connection) (liters) Note: Enter 99 if don't know 4.2.9 (eradaneya nala) balakeya neerina pramanavanu dhakalisi (liters) tippani: gottilladiddare 99 antha bareyiri.	□□□□□□
i38cwbilldate1 **i44cwbilldate2**	input, DATE, date must be in past	4.2.10 Enter the billing date (for the second connection) Note: Enter 99 if don't know 4.2.10 (eradaneya nala) billannu kotta dinanka dhakalisi tippani: gottilladiddare 99 antha bareyiri.	
i45cwpaylastmonth	input, integer, <10000	*(Note: If 4.2.2. is 1)* 4.2.11 Last month, how much did you pay? (Ru.) Note: Enter 99 if don't know 4.2.11 kaleda tingalu neevu eshtu hanavannu kattiddiri? (ru.) tippani: gottilladiddare 99 antha bareyiri.	□□□□
i45cwpayreg	select1, string 1 0	*(Note: If (4.2.1 is 1 OR 4.2.2 is 1) AND 4.1.22 is 2)* 4.2.12 Are you paying the water bill regularly? 4.2.12 neevu sariyagi neerina billannu pavatisuttiddira? Yes No	□

i45cwpayregwhy	select1, string 1 2 3 4 1 2 3 4	*(Note: If 4.2.12 is 0)* 4.2.13 Why are you not paying regularly? 4.2.13 yake neevu billannu pavatisuttilla? Charges are high I cannot afford to pay I do not want to pay Others (specify) neerina dara jasti ide nanage astondu hana pavatisalu sadyavaguttilla nanage pavatisuvadu bekilla itare (namoodisiri)	□
i45payregsp	input, string	*(Note: If 4.2.13 is 4)* 4.2.14 Specify 4.2.14 namoodisiri	
i45cwwilling	input, integer	*(Note: If 4.2.13 is 1 OR 2)* 4.2.15 What amount are you willing to pay per month for 24 hours water supply? 4.2.15 neevu 24 ghante neerige eshtu hanavannu kodalu bayasuttiri? (Rs.)	□□□□
4.3 Customer Satisfaction **4.3 Grahaka Trupti**			
i46cwquantfeel	select1, string 1 2 3	4.3.1 Are you happy with the quantity of Corporation water that you receive? 4.3.1 nimage siguva Corporation neerina pramanadinda santoshavagideye? Happy OK Unhappy	□

	1 2 3	santosha agide addilla santoshavagilla	
i47cwqualfeel	select1, string 1 2 3 1 2 3	4.3.2 Are you happy with the quality of the Corporation water that you receive? 4.3.2 nimage siguva Corporation neerina gunamattadinda santoshavagideye? Happy OK Unhappy santosha agide addilla santoshavagilla	□
i48cwpressfeel	select1, string 1 2 3 1 2 3	4.3.3 Are you happy with the pressure of the Corporation water supply? 4.3.3 nimage siguva Corporation neerina force dinda santoshavagideye? Happy OK Unhappy santosha agide addilla santoshavagilla	□
i48d247prob	select1, string 1	*(Note: In 24/7 only)* 4.3.4 Have you faced any problems in availability and usage of water under 24x7? 4.3.4 neevu 24x7 neerina sarabarajeenalli athava upayogisuvaga yavudadaru samasye anubhavisiddira? Yes	□

	0	No	
i48d247probwhat_multi_	select, string nowater logging waste other nowater logging waste other	*(Note: If 4.3.4 is 1)* 4.3.5 Give details: 4.3.5 vivara needi: No water when current supply is off Water logging in front of the house Wastage of water Others (specify) vidyut illadaga neerina sarabarajuagiruvadilla maneya munde tumba neeru nilluvadu neeru tumba waste aguttade itare (namoodisiri)	□
i48d247probwhatsp	input, string	*(Note: If 4.3.5 is 4)* 4.3.6 Specify 4.3.6 namoodisiri	
i48dpaygood	select1, string 1 0 99	*(Note: In 24/7 only)* 4.3.7 Do you think that the current water charges are appropriate? 4.3.7 nimma prakara prastuta neerina dara sukthavagideye? Yes No Don't know	□
i48dpaywhat	input, integer	*(Note: If 4.3.7 is 0)* 4.3.8 What do you think should be the appropriate charges per month? (Rs)	□□□

		4.3.8 eshtu dara nigadipadisabeku? (Ru)	
i48dvisit	select1, string 1 0 99	*(Note: In 24/7 only)* 4.3.9 Has anyone from the WSB visited your house to enquire about the availability of water? 4.3.9 jala mandaliyinda yaradaru nimage siguttiruva neerina labyate bagge vicharisiddareye? Yes No Don't know	
i48dmeeting	select1, string 1 0 99	*(Note: In 24/7 only)* 4.3.10 Have you/household member ever participated in any community meetings related to 24/7 water supply? 4.3.10 neevu athava nimma maneya yaradaru sadasyaru, 24x7 neerina sarabarajige sambandapatta yavudadaru samudayika sabheyalli bhagavaisiddira? Yes No Don't know	
i48dmeetingno	input, int	*(Note: If 4.3.10 is 1)* 4.3.11 How many times? 4.1.24 yesthu sala?	
i48dprocess	select1, string	*(Note: In 24/7 only)* 4.3.12 Have you/household member ever participated in any procession/Dharana in connection with water supply?	

	1 0 99	4.3.12 neevu athava nimma maneya yaradaru sadasyaru, 24x7 neerina sarabarajige sambandapatta yavudadaru dharani athava strike alli bhagavaisiddira? Yes No Don't know	
i48dprocessno	input, int	*(Note: If 4.3.12 is 1)* 4.3.13 How many times? 4.3.13 yesthu sala?	□□
i48dcomp	select1, string 1 0 99	*(Note: In 24/7 only)* 4.8 Have you lodged any complaint about problems in 24x7 water supply to anybody? 4.8 neevu 24x7 neerige sambadisida tondaregala bagge yarigadaru duru sallisiddira? Yes No Don't know	
i48dcompsolve	select1, string 1 0	*(Note: If 4.8 is 1)* 4.9 Was the problem solved? 4.9 sambandapattavarinda ee samasye nivarane agideya? Yes No	
4.4 Borewell Water/Open Well **4.4 Borewell Neeru/Tereda Bavi**			
i49bwmonth	select1, string	4.4.1 In the last month, did you collect water from a borewell or open well? 4.4.1 kaleda ondu tingalalli, neevu kolave bavi/ tereda baviyinda neerannu sangrahisiddira?	□

		1 0	Yes (Skip to 4.4.3) No	
i50bwtankmonth	select1, string	1 0	*(Note: If 4.4.1 is 0)* 4.4.2 In the last month, did you collect water from a public water tank? 4.4.2 kaleda ondu tingalalli, neevu sarvajanika neerina tank ninda neerannu sangrahisiddira? Yes (Skip to 4.6) No (Skip to 4.7)	☐
i51bwwhere	select1, string	1 2 3 4 5 6 7 8 1 2 3 4 5 6	4.4.3 In the last month, where did you primarily collect your borewell or open well water, including any piped water schemes? 4.4.3 kaleda ondu tingalalli, neevu samanyavagi yellinda, kolave bavi/ tereda baviya neeru mattu nalada moolaka banda nirannu sangrahisiddira? Borewell/open well which you own Borewell water piped to your home (no overhead tank) Borewell water from a shared overhead tank Neighbor's private well Public Tank Public standpipe Public handpump Other swanta kolave bavi/tereda bavi nimma manege pipe moolaka jodisiruva kolave bavi neeru(mahadi mele taki illa) mahadi melina taki inda hanchikondiruva kolave bavi neeru nerehoreyavara swanta kolave bavi sarvajanika tank sarvajanika nala sarvajanika kaipump	☐

	7 8	itare	
i52bwnumhh	input, integer, <1000	4.4.4 How many households obtain water from this borewell/ open well? <u>Note: Enter 99 if don't know</u> 4.4.4 ee kolave bavi / tereda baviya inda eshtu maneya janaru neerannu padeyuttare? <u>tippani: gottilladiddare 99 antha bareyiri.</u>	□□□
(Note: If 4.4.3 is 2, 3, 4, 5, 6, 7 or 8, then skip to 4.6)			
4.5 Own Borewell / Open Well **4.5 Swanta borewell / Terediruva bavi**			
i53bwownyears	input, decimal, <100	4.5.1 How many years ago did you drill a new borewell/ open well? (years) <u>Note: Enter 99 if don't know</u> 4.5.1 eshtu varushagala hinde neevu ee kolave bavi/ tereda baviya todiddiri?(varushagalu) <u>tippani: gottilladiddare 99 antha bareyiri.</u>	□□.□
i54bwowndepth	input, decimal, <100	4.5.2 What is the depth of your borewell/ open well? (feet) <u>Note: Enter 99 if don't know</u> 4.5.2 nimma kolave bavi/ tereda baviya aala eshtu iruvudu? (feet) <u>tippani: gottilladiddare 99 antha bareyiri.</u>	□□.□
i55bwowndepthw	input, decimal, <100	4.5.3 What is the depth of water in the borewell/ open well (feet) <u>Note: Enter 99 if don't know</u> 4.5.3 nimma kolave bavi/ tereda baviya neerina aala eshtu iruvudu?(feet) <u>tippani: gottilladiddare 99 antha bareyiri.</u>	□□.□

i56bwownqual	select1, string 1 2 1 2	4.5.4 How is the quality of water in the borewell/ open well? 4.5.4 kolave bavi/tereda baviya neerina gunamatta hegide? Sweet Salty sihi uppina	□
i57bwowncost	input, decimal, <100000	4.5.5 How much did the borewell/ open well cost? (Ru.) Note: Enter 99 if don't know 4.5.5 kolave bavi/tereda baviya vechha eshtu aagittu? tippani: gottilladiddare 99 antha bareyiri.	□□□□□
i58bwownmaintain	input, decimal, <10000	4.5.6 In the last year, how much did you spend on maintaining this borewell/ open well? (Ru.) Note: Enter 99 if don't know 4.5.6 kaleda ondu varshadalli neevu ee kolave bavi/tereda baviya durastigagi eshtu hana vechha madiddiri? (ru.) tippani: gottilladiddare 99 antha bareyiri.	□□□□
4.6 Fetched Borewell Water / Intermittent Piped Borewell Water/ Water Tank/ Piped Borewell water With Shared Overhead Tank 4.6 Horatageda borewell neeru/Neerina tank/ Mahadi Melina tank inda hanchikondiruva kolave bavi neeru			
i59bwowns	select1, string 1 2 3 4 5	4.6.1 Who owns this water source? 4.6.1 ee neerina maalikaru yaru? Neighbor Owner of house/apartment building Housing association/apartment building Corporation/ Water Board	□

	6 99 1 2 3 4 5 6 99	Community group Other Don't Know nerahore maneya malikaru apartment kattada Corporation/ Jalmandala/ Jalmandali soansthe samudayika gumpu itare gottilla	
i60bwcwsaltyfreq	select1, string 1 2 3 4 5 99 1 2 3 4 5 99	*(Note: If 4.1.4 is 1)* 4.6.X Currently, how often is salty water available from your corporation tap? 4.6.X eega, eshtu sala uppinna neeru Corporation naladinda padeyuttiddiri? 24 hours everyday Once everyday Every 2 days 3-5 days 6 or more days Don't know pratidina, 24 ghante divasakkomme prati eradu divasakkomme 3-5 divasagalu 6 athava hechhina divasagalu Gottilla	□□
i61bwfreq	select1, string	*(Note: If (I50BWTankMonth, '1' or I51BWWhere NOT '1') and I49BWMonth=1))* *(Note:ODK will say "borewell" if public tank was not the source. Otherwise "borewell" will be deleted.)*	□□

		4.6.2 Currently, how often is water available from this source? 4.6.2 eega, eshtu divasakomme ee mooladinda neeru labyavaguttide?	
	1 2	24 hours everyday Once everyday	
	3 4 5	Every 2 days 3-5 days 6 or more days	
	99 1 2 3 4 5 99	Don't know pratidina, 24 ghante divasakkomme prati eradu divasakkomme 3-5 divasagalu 6 athava hechhina divasagalu gottilla	
i62bwpay	select1, string 1 2 3 4 99 1 2 3 4 99	*(Note: If 4.4.3 is 3)* 4.6.3 How do you pay for this water? <u>Note: Read ALL options.</u> <u>4.6.3 neevu ee neerigagi hege duddannu kattidiri?</u> <u>tippani: yella aikegalannu odiri.</u> Separately from other maintenance fees Part of maintenance fee Included in rent (Skip to 4.6.5) Not at all (Skip to 4.6.5) Don't know (Skip to 4.6.5) pratyekavagi bere durastigagi itta hana durastigagi itta bhagada hana badigeyalli seride enu illa gottilla	□□

i63bwpaymonth	input, integer, <1000	*(Note: If 4.6.3 is 2 OR 3)* 4.6.4 Last month, how much did you pay for this water? (Ru.) Note: Enter 99 if don’t know. 4.6.4 kaleda tingalu neevu eshtu hanavannu ee neerigagi kottiddiri? (Ru.) tippani: gottilladiddare 99 antha bareyiri.	□□□
i63bwpaymonthall	input, integer, <1000	*(Note: If 4.4.3 is 2, 4)* 4.6.4 In the last six months, how much did you pay for this water? (Ru.) Note: Enter 99 if don’t know. 4.6.4 kaleda aaru tingalalli neevu eshtu hanavannu ee neerigagi kottiddiri? (Ru.) tippani: gottilladiddare 99 antha bareyiri.	□□□
i64bwdaysago	select1, string 1 2 3 4 5 99 1 2 3 4 5 99	4.6.5 How many days ago did you last collect water from this source? 4.6.5 eshtu divasagalahinde neevu ee neerannu allinda tandiddiri? Today Yesterday 2-3 days ago 4-6 days ago 7 or more days ago Don’t know Ivattu Ninne 2-3 divasagala hinde 4-6 divasagala hinde 7 athava adakinta hechhina divasagala hinde	□□

		gottilla	
i65bwtimetoget	select1, string 1 2 3 4 5 6 99 1 2 3 4 5 6 99	4.6.6 Last time you collected water from this source how long did it take (to walk there, wait your turn), fill ALL of your storage containers and come back? 4.6.6 hoda sala neevu nimage sakaguvastu neeru tumbikondu taralu (hogi baralu,palegagi kayalu) eshtu samayavannu tegedukondiddiri? 0 minutes to 30 minutes More than 30 minutes up to 1 hour More than 1 hour up to 2 hours More than 2 hours, up to 3 hours More than 3 hours, up to 4 hours More than 4 hours Don't know 0 rinda 30 nimisha 30 nimishakinta hechhu ondu ghanteyavarege ondu ghanteginta hecchu 2 ghanteyavarege 2 ghanteginta hecchu 3 ghanteyavarege 3 ghanteginta hecchu 4 ghanteyavarege 4 ghantegintha hechhu gottilla	
4.7 Truck Water **4.7 Tanker Neeru**			
i66truck	select1, string 1 0	4.7.1 In the last month, did you collect water from a tanker truck or water truck? 4.7.1 kaleda ondu tingalalli, neevu tanker athava truck neerannu sangrahisiddira? Yes	

		No (Skip to 4.8)	
i67truckfrom	select1, string hdmc private dk hdmc private dk	*(Note: If 4.7.1 is 1)* 4.7.2 Was the truck water from: Note: Read ALL options. 4.7.2 tanker neeru ee kelegina yavudakke seride? tippani: yella aikegalannu odiri. Corporation or Water Board Private company Don't know Corporation khasagi saonsthe gottilla	□
i68atruckpurchase	input int <100000	*(Note: If 4.7.1 is 1)* 4.7.3 What amount did you purchase? Enter number. 4.7.3 neevu eshtu pramanada neerannu kharidisiddiri? sankyeyannu namoodisi	□□□□□
i68btruckmany	select1 string 1 2 3 4 5 6 99	*(Note: If 4.7.1 is 1)* 4.7.4 Now enter the unit: 4.7.4 pramanavannu namoodisiri Koda Liters Overhead tank Underground tank Truck Other Don't know	□

	1 2 3 4 5 6 99	 koda liters mahadi melina tank neladolage muchhida neeru sangrahane tank truck itare gotilla	
i68ctruckshare	input, integer, <10000	*(Note: If 4.7.1 is 1)* 4.7.5 How many households shared this water? Note: Enter 99 if don't know 4.7.5 eshtu kutumbagalu ee neerannu hanchi kondiddare? tippani: gottilladiddare 99 antha bareyiri.	□
i68truckpay	input, integer, <100	*(Note: If 4.7.1 is 1)* 4.7.6 How much did you pay? (Ru.) Note: Enter 99 if don't know 4.7.6 neevu eshtu hanavannu vechha madiddiri? (ru.) tippani: gottilladiddare 99 antha bareyiri.	□□
4.8 Bottled Water **4.8 Baatali neeru**			
i69bottled	input, integer, <100	4.8.1 In the last week, how many liters of bottled water did you buy for household consumption? Note: Enter 99 if don't know 4.8.1 kaleda ondu varadalli, mane balakegagi eshtu litre batali neerannu kharidisiddiri? tippani: gottilladiddare 99 antha bareyiri.	□□
4.8.2 Male Water			

4.8.2 Male neeru			
I69arainh2o	select1, string 1 0 99	4.8.2 Do you collect and store rainwater? 4.8.2 Neevu male neerannu sangrahisiddira? Yes No DK	□□
4.9 Overhead Storage **4.9 Mahadi melina tank alli sangrahisida neeru**			
i70ohtank	select1, string 1 0 99	4.9.1 Currently, do you store water in an overhead tank? 4.9.1 eaga, neevu mahadiya melina tank alli neerannu sangrahisutiddira? Yes No (Skip to 4.10) DK (Skip to 4.10)	□□
i71ohtankhh	input, integer, <100	4.9.2 How many households use water from these tanks? Note: Enter 99 if don't know 4.9.2 eshtu manegalu ee mahadiya melina neerannu upayogisuttiddiri? tippani: gottilladiddare 99 antha bareyiri.	□□
i72ohtankvol	input, integer, <100000	4.9.3 What is the total number of liters of overhead storage that you currently use? Note: Enter 99 if don't know 4.9.3 eega neevu balasuva mahadiya melina tank alli eshtu liter neeru tumba bahudu? tippani: gottilladiddare 99 antha bareyiri.	□□□□□
	select all	4.9.4 What are these overhead tanks made of? 4.9.4 mahadiya melina tank annu yavududarinda madalpattide?	
i73ohtanktype_multi		Sintex (Yes=1, No=0)	□

_sintex		Sintex (Haudu=1, Illa=0)	
i73ohtanktype_multi_concrete		Concrete(Yes=1, No=0) Cement Concrete (Haudu=1, Illa=0)	□
i73ohtanktype_multi_other		Other(Yes=1, No=0) itare(Haudu=1, Illa=0)	□
i73ohtanktype_multi_dk		Don't know(Yes=1, No=0) gottilla (Haudu=1, Illa=0)	□
	select all	4.9.5 Currently, what kind of water is in these tanks? Note: Read ALL options. Ask until nothing else mentioned. Check ALL mentioned. 4.9.5 eega ee takiyalli yava neeru ide? tippani: avaru heluva tanaka kayiri, avaru onde uttarisidalli atava heladiddare. kelagiruva aikegalannu keli.	
i74ohtankwhatw_multi_empty		They are empty (Yes=1, No=0) avu khaliyagive (Haudu=1, Illa=0)	□
i74ohtankwhatw_multi_well		Borewell or open well water(Yes=1, No=0) borewell athava tereda bavi neeru(Haudu=1, Illa=0)	□
i74ohtankwhatw_multi_hdmcsalt		Corporation salty piped water (Yes=1, No=0) corporation uppina neeru (Haudu=1, Illa=0)	□
i74ohtankwhatw_multi_cw		Corporation water (Yes=1, No=0) corporation neeru (Haudu=1, Illa=0)	□
i74ohtankwhatw_multi_other		Other (Yes=1, No=0) itare (Haudu=1, Illa=0)	□
i74ohtankwhatw_multi_dk		Don't know (Yes=9, No=0) gottilla (Haudu=9, Illa=0)	□
i75ohtankfill	select1, string	*(Note: In non 24/7 only)* 4.9.6 How many days ago were these tanks filled with Corporation water? 4.9.6 eshtu divasagala hinde ee tankgalu Corporation neerininda tumbiddavu? 1 2 Today 3 Yesterday 4 2-3 days ago 5 4-6 days ago	□□

	99 1 2 3 4 5 99	7 or more days ago Don't know ivattu ninne 2-3 divasagala hinde 4-6 divasagala hinde 7 athava adakinta hechhina divasagala hinde gottilla	
i76ohtankcost	input, integer, <100000	4.9.7 If you own these tanks, this past year how much did you spend on their maintenance? (Ru.) <u>Note: Enter 99 if don't know</u> 4.9.7 neevu ee tankgala malikaru agiddare, kaleda varshadalli durastige eshtu hanavannu vechha madiddiri? (Ru.) <u>tippani: gottilladiddare 99 antha bareyiri.</u>	□□□□□
i77ohtankreplace	select1, string replace remove other dk replace remove other dk	*(Note: In 24/7 only, if 4.9.7 is not 99)* 4.9.8 When it's time to replace your tanks, what will you do? 4.9.8 tankgalannu badalaisuva samayadalli, neevu enu maduviri? Replace Remove and re-plumb Other Don't know badalyisudu tagedu matte hakudu itare gottilla	□□
4.10 Underground Storage **4.10 Neladolage muchhida neeru sangrahane**			
i78ugtank	select1, string	4.10.1 Currently, do you store water in a closed underground storage tank?	□□

	1 0 99	4.10.1 eaga, neevu neladolage muchhida neeru sangrahane tank alli neerannu sangrahisutiddira? Yes No (Skip to 4.11) DK (Skip to 4.11)	
i79ugtankvol	input, integer, <1000000	4.10.2 How many liters can you store in your underground tank/tanks? (liters) Note: Enter 99 for if don't know. 4.10.2 neladolagina tank galalli neevu eshtu litre neerannu sangrahisabahudu? tippani: gottilladiddare 99 annu bareyiri.	□□□□□
i80ugtankage	input, integer, <100	4.10.3 How many years ago did you install these? (years) Note: Enter 99 for if don't know. 4.10.3 eshtu varushagala hinde neevu idannu kattisiddiri? (varushagalu) tippani: gottilladiddare 99 annu bareyiri.	□□
i81ugtankhh	input, integer, <100	4.10.4 How many households use these underground tanks? Note: If the tanks are not in use, then put '0'. Enter 99 for if don't know. 4.10.4 eshtu manegalu ee neladolagiruva tank annu upasogisuttare? tippani: adu yaru upayogisidillavadare 0 annu bareyiri. gottilladiddare 99 annu bareyiri.	□
i82ugtankcost	input, integer, <10000	4.10.5 How much did it cost to install these tanks? (Rs.) Note: Enter 99 for if don't know. 4.10.5 ee tank annu kattalu eshtu hana vechha	□□□□

		madiddiri? (ru.) tippani: gottilladiddare 99 annu bareyiri.	
i83ugtankmaint	input, integer, <100000	4.10.6 This past year, how much did you spend on maintenance of these tanks? (Rs.) Note: Enter 99 for if don't know. 4.10.6 kaleda varshadalli durastige eshtu hanavannu vechha madiddiri? (Ru.) tippani: gottilladiddare 99 annu bareyiri.	□□□□□
4.11 Motor/Pump **4.11 Motor/Pump**			
i84motor	input, integer, <100	4.11.1 Currently, how many motors do you use? Note: Enter 99 for if don't know. 4.11.1 eega neevu eshtu motorgalannu upayogisuttiri? tippani: gottilladiddare 99 annu bareyiri.	□□
(Note: 4.11.2 – 4.11.4 should be repeated for each of the motors, up to a maximum of at least 2 motors.)			
i85motorcost1 **i88motorcost2**	input, integer, <100000	4.11.2 How much did the (first/second) motor cost? (Ru.) Note: Enter 99 for if don't know. 4.11.2 (ondane/eradane) motorina bele eshtagittu? (ru.) tippani: gottilladiddare 99 annu bareyiri.	□□□□□
i86motorcapacity1 **i89motorcapacity2**	input, integer, <100000	4.11.3 What is its capacity? (HP) Note: Enter 99 for if don't know.	□□

		4.11.3 adara samarthya/capacity enu? (HP) tippani: gottilladiddare 99 annu bareyiri.	
i87motorfreq1 **i90motorfreq2**	select1, string	4.11.4 In the last week, how much time did you run the (first/second) motor? 4.11.4 kaleda ondu vara neevu eshtu ghante (ondane/eradane) motorannu upayogisiddiri? 1 2 0 minutes to 30 minutes 3 More than 30 minutes up to 1 hour 4 More than 1 hour up to 2 hours 5 More than 2 hours, up to 3 hours 6 More than 3 hours, up to 4 hours 99 More than 4 hours Don't know 1 2 0 rinda 30 nimisha 3 30 nimishakinta hechhu ondu ghanteyavarege 4 ondu ghanteginta hecchu 2 ghanteyavarege 5 2 ghanteginta hecchu 3 ghanteyavarege 6 3 ghanteginta hecchu 4 ghanteyavarege 99 4 ghantegintha hechhu gottilla	
i91motorattach	select1, string	*(Note: In non 24/7 only)* 4.11.5 Do you attach your motor directly to the Corporation tap? 4.11.5 neevu motor/pamp annu corporation nalakke neravagi hachuttira? 1 0 Yes No	
		Section 5: Water Quality and Treatment **upa bhaga 5: neerina gunamatta hagu shuddikarana**	

j10treatchild	select1, string 1 0 2 99	5.1 Currently, do you do anything to your drinking water to make it better for your children? 5.1 eega, neevu nimma makkalige koduva kudiyuva neerina gunamatta hechhisalu enadaru maduttira? Yes No (Skip to 5.5) Child too young for water/magu neeru kudiyalagadastu sanna vayassinadagiruttade (Skip to 5.5) DK (Skip to 5.5)	□□
	select all	*(Note: If 5.1 is 1)* 5.2.1 Currently, what do you do to make your drinking water better for < B15C1Name>? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned. 5.2.1 eega, neevu < B15C1Name>ge koduva kudiyuva neerina gunamatta hechhisalu enannu maduttera? tippani: avaru heluvatanaka kayiri, nivu aikegalannu oodabedi.	
j11treatchildw1_multi_young		Child too young for water (Yes=1, No=0) neeru kudiyalagadastu sanna vayassinadagiruttade (Haudu=1, Illa=0)	□
j11treatchildw1_multi_boil		Boil (Yes=1, No=0) kudisu (Haudu=1, Illa=0)	□
j11treatchildw1_multi_cltab		Add chlorine tablets (Yes=1, No=0) chlorine guligeye balake (Haudu=1, Illa=0)	□
j11treatchildw1_multi_cloth		Filter water through cloth (Yes=1, No=0) neerannu batteinda sosuvudu (Haudu=1, Illa=0)	□
j11treatchildw1_multi_candle		Use steel filter/ ceramic candle filter (Yes=1, No=0) steel filter/ kumbarikeya candle sosuva patre (Haudu=1, Illa=0)	□
j11treatchildw1_multi_pureit		Use Pureit/Aquasure (Yes=1, No=0) Pureit/ Aqua guard na balake (Haudu=1, Illa=0)	□
j11treatchildw1_multi_othercomm		Use other commercial filter (Yes=1, No=0) bere yavudadaru vyaparika sosuva patre (Haudu=1, Illa=0)	□
j11treatchildw1_mult		Other (Yes=1, No=0)	□

i_other		itare (Haudu=1, Illa=0)	
j12treatchildother1	input, string	*(Note: If yes to "other" in 5.2)* 5.2.1.1 Specify other type 5.2.1.1 itare spashteekarisi	
	select all	*(Note: If 5.1 is 1)* 5.2.2 Currently, what do you do to make your drinking water better for <E10C2Name>? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned. 5.2.2 eega, neevu <E10C2Name>ge koduva kudiyuva neerina gunamatta hechhisalu enannu maduttera? tippani: avaru heluvatanaka kayiri, nivu aikegalannu oodabedi.	
j11treatchildw2_multi_young		Child too young for water (Yes=1, No=0) neeru kudiyalagadastu sanna vayassinadagiruttade (Haudu=1, Illa=0)	□
j11treatchildw2_multi_boil		Boil (Yes=1, No=0) kudisu (Haudu=1, Illa=0)	□
j11treatchildw2_multi_cltab		Add chlorine tablets (Yes=1, No=0) chlorine guligeye balake (Haudu=1, Illa=0)	□
j11treatchildw2_multi_cloth		Filter water through cloth (Yes=1, No=0) neerannu batteinda sosuvudu (Haudu=1, Illa=0)	□
j11treatchildw2_multi_candle		Use steel filter/ ceramic candle filter (Yes=1, No=0) steel filter/ kumbarikeya candle sosuva patre (Haudu=1, Illa=0)	□
j11treatchildw2_multi_pureit		Use Pureit/Aquasure (Yes=1, No=0) Pureit/ Aqua guard na balake (Haudu=1, Illa=0)	□
j11treatchildw2_multi_othercomm		Use other commercial filter (Yes=1, No=0) bere yavudadaru vyaparika sosuva patre (Haudu=1, Illa=0)	□
j11treatchildw2_multi_other		Other (Yes=1, No=0) itare (Haudu=1, Illa=0)	□

j12treatchildother2	input, string	*(Note: If yes to "other" in 5.2)* 5.2.2.1 Specify other type 5.2.2.1 itare spashteekarisi	
	select all	*(Note: If 5.1 is 1)* 5.2.3 Currently, what do you do to make your drinking water better for <F10C3Name>? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned. 5.2.3 eega, neevu <F10C3Name>ge koduva kudiyuva neerina gunamatta hechhisalu enannu maduttera? tippani: avaru heluvatanaka kayiri, nivu aikegalannu oodabedi.	
j11treatchildw3_multi_young		Child too young for water (Yes=1, No=0) neeru kudiyalagadastu sanna vayassinadagiruttade (Haudu=1, Illa=0)	☐
j11treatchildw3_multi_boil		Boil (Yes=1, No=0) kudisu (Haudu=1, Illa=0)	☐
j11treatchildw3_multi_cltab		Add chlorine tablets (Yes=1, No=0) chlorine guligeye balake (Haudu=1, Illa=0)	☐
j11treatchildw3_multi_cloth		Filter water through cloth (Yes=1, No=0) neerannu batteinda sosuvudu (Haudu=1, Illa=0)	☐
j11treatchildw3_multi_candle		Use steel filter/ ceramic candle filter (Yes=1, No=0) steel filter/ kumbarikeya candle sosuva patre (Haudu=1, Illa=0)	☐
j11treatchildw3_multi_pureit		Use Pureit/Aquasure (Yes=1, No=0) Pureit/ Aqua guard na balake (Haudu=1, Illa=0)	☐
j11treatchildw3_multi_othercomm		Use other commercial filter (Yes=1, No=0) bere yavudadaru vyaparika sosuva patre (Haudu=1, Illa=0)	☐
j11treatchildw3_multi_other		Other (Yes=1, No=0) itare (Haudu=1, Illa=0)	☐
j12treatchildother3	input,	*(Note: If yes to "other" in 5.2)*	

	string	5.2.3.1 Specify other type 5.2.3.1 itare spashteekarisi	
j13treatadult	select1, string 1 0 99	*(Note: if yes to 5.1)* 5.4 Do adults also drink this water? 5.4 hiriyaru kooda ide neerannu balasuttareye? Yes (Skip to treatment indicated in 5.2) No DK	□□
j14treatfamily	select1, string 1 0 99	5.5 Currently, do you do anything to your drinking water to make it better for other family members? 5.5 eega, neevu nimma kutumbada bere sadasyarige koduva kudiyuva neerina gunamatta hechhisalu enadaru maduttira? Yes No DK	□□
	select all	5.6 Currently, what do you do to make your drinking water better for your family members? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned. 5.6 eega, nimma kutumbadavaru gunamattada nirannu kudiyalu enu maduttiri? tippani: avaru heluvatanaka kayiri, nivu aikegalannu oodabedi	
j15treatfamilyw_multi_boil		Boil (Yes=1, No=0) kudisu (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_cltab		Add chlorine tablets (Yes=1, No=0) chlorine guligeye balake (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_cloth		Filter water through cloth (Yes=1, No=0) neerannu batteinda sosuvudu (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_candle		Use steel filter/ ceramic candle filter (Yes=1, No=0) steel filter/ kumbarikeya candle sosuva patre (Haudu=1,	□

		Illa=0)	
j15treatfamilyw_multi_pureit		Use Pureit/Aquasure (Yes=1, No=0) Pureit/ Aqua guard na balake (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_othercomm		Use other commercial filter (Yes=1, No=0) bere yavudadaru vyaparika sosuva patre (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_other		Other (Yes=1, No=0) itare (Haudu=1, Illa=0)	□
j16treatfamilyother	input, string	*(Note: If yes to "other" in 5.2)* 5.7 Specify other type 5.7 itare spashteekarisi	
j16Adrinktreatyou	Select1, string 1 0 99	5.7.1 Do you also drink this water? 5.7 .1 Neevu ee nirannu saha kudiyalu balasuttira? Yes No DK	□□
j14treatfamily	select1, string 1 0 99	5.5 Currently, do you do anything to your drinking water to make it better for yourself? 5.5 eega, neevu kudiyuva neerina gunamatta hechhisalu enadaru maduttira? Yes No DK	□□
	select all	5.6 Currently, what do you do to make your drinking water better for yourself? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned. 5.6 eega neevu gunamattada nirannu kudiyalu enu maduttiri? tippani: avaru heluvatanaka kayiri, nivu aikegalannu oodabedi	

j15treatfamilyw_multi_boil		Boil (Yes=1, No=0) kudisu (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_cltab		Add chlorine tablets (Yes=1, No=0) chlorine guligeye balake (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_cloth		Filter water through cloth (Yes=1, No=0) neerannu batteinda sosuvudu (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_candle		Use steel filter/ ceramic candle filter (Yes=1, No=0) steel filter/ kumbarikeya candle sosuva patre (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_pureit		Use Pureit/Aquasure (Yes=1, No=0) Pureit/ Aqua guard na balake (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_othercomm		Use other commercial filter (Yes=1, No=0) bere yavudadaru vyaparika sosuva patre (Haudu=1, Illa=0)	□
j15treatfamilyw_multi_other		Other (Yes=1, No=0) itare (Haudu=1, Illa=0)	□
j16treatfamilyother	input, string	*(Note: If yes to "other" in 5.2)* 5.3 Specify other type 5.3 itare spashteekarisi	

5.8 Standard Treatment Questions

j17treatwhenboil	select1, string	*(If boiled chosen in 5.2 or 5.6)* 5.8.1 When was the last time you boiled your drinking water? 5.8.1 koneyadagi neevu kudiyuva neerannu yavaga kudisidiri?	□□
	0		
	1	Today	
	2	Yesterday	
	3	2-3 days ago	
	4	4-6 days	
	5	7 – 15 days ago	
	6	16 days to 1 month ago	
	99	More than 1 month ago	
		Don't know	

	0 1 2 3 4 5 6 99	ivattu ninne 2-3 divasagala hinde 4-6 divasagala hinde 7-15 divasagala hinde 16-30 divasagala hinde ondu tingaliginta hechhu gottilla	
j18treatnowboil	select1, string 1 0	5.8.2 Do you have any of this water in your house right now? 5.8.2 eega nimma maneyalli ee neeru ideye? Yes No	□
j19treatwhencl	select1, string 0 1 2 3 4 5 6 99 0 1 2 3 4 5	*(If chlorine tablets chosen in 5.2 or 5.6)* 5.8.3 When was the last time you added chlorine tablets your drinking water? 5.8.3 koneyadagi neevu kudiyuva neerannu yavaga chlorine guligeya balake? Today Yesterday 2-3 days ago 4-6 days 7 – 15 days ago 16 days to 1 month ago More than 1 month ago Don't know ivattu ninne 2-3 divasagala hinde 4-6 divasagala hinde 7-15 divasagala hinde	□□

	6 99	16-30 divasagala hinde ondu tingaliginta hechhu gottilla	
j20treatnowcl	select1, string 1 0	5.8.4 Do you have any of this water in your house right now? 5.8.4 eega nimma maneyalli ee neeru ideye? Yes No	□
j21treatwhenfilter	select1, string 0 1 2 3 4 5 6 99 0 1 2 3 4 5 6 99	*(If filter chosen in 5.2 or 5.6)* 5.8.5 When was the last time you filtered your drinking water? 5.8.5 koneyadagi neevu kudiyuva neerannu yavaga sosiddiri? Today Yesterday 2-3 days ago 4-6 days 7 – 15 days ago 16 days to 1 month ago More than 1 month ago Don't know ivattu ninne 2-3 divasagala hinde 4-6 divasagala hinde 7-15 divasagala hinde 16-30 divasagala hinde ondu tingaliginta hechhu gottilla	□□
j22treatnowfilter	select1, string	5.8.6 Do you have any of this water in your house right now?	□

	1 0	5.8.6 eega nimma maneyalli ee neeru ideye? Yes No	
j23treatwhenother	select1, string 0 1 2 3 4 5 6 99 0 1 2 3 4 5 6 99	*(If "other" chosen in 5.2 or 5.6)* 5.8.7 When was the last time you used this treatment method on your drinking water? 5.8.7 lakeda sala, neevu yavaga ee sosuva vidhane vannu upayogisiddiri? Today Yesterday 2-3 days ago 4-6 days 7 – 15 days ago 16 days to 1 month ago More than 1 month ago Don't know ivattu ninne 2-3 divasagala hinde 4-6 divasagala hinde 7-15 divasagala hinde 16-30 divasagala hinde ondu tingaliginta hechhu gottilla	□□
j24treatnowother	select1, string	5.8.8 Do you have any of this water in your house right now? 5.8.8 eega nimma maneyalli ee neeru ideye? Yes No	□
		5.9 Chlorine Tablets/ Other	

j25treatbuy	select1, string 1 2 3 4 5 99 1 2 3 4 5 99	*Note: ODK will insert the reported treatment method, either chlorine tablets, or the "other" treatment method specified.* 5.9.1 When was the last time you obtained (chlorine tablets/that treatment)? 5.9.1 koneidagi neevu yavaga (chlorine guligeye/adara) annu padediddiri? Less than 1 month ago 1-3 months ago 4-6 months ago 7-12 months ago More than 1 year ago Don't know 1 tingala hinde 1-3 tingalugala hinde 4-6 tingalugala hinde 7-12 tingalugala hinde 1 varshakinta hechhu gottilla	□
j26treatcost	input, integer, <100	5.9.2 How much did it cost? (Rs) <u>Note: Enter 99 for don't know</u>. 5.9.2 adaramele eshtu vecchha madidiri? (ru) <u>tippani: gottilladiddare 99 annu bareyiri.</u>	□□
5.10 PureIt/ Aquasure/ Candle Filter/Other Commercial Filter			
j27filtercost	input, integer, <10000	5.10.1 How much did you pay for your filter unit? (Rs) <u>Note: Enter 99 for don't know.</u> 5.10.1 neevu neeru sosuva patreyannu kharidisalu eshtu hana kottiddiri? (ru.) <u>tippani: gottilladiddare 99 annu bareyiri.</u>	□□□□
j28filterreplace	select1, string	5.10.2 When was the last time you purchased a replacement part?	□□

	1 2 3 4 5 99 1 2 3 4 5 99	5.10.2 koneyadagi neevu yavaga hosa sosuva part/ bhaga badalisiddeeri? Less than 1 month ago 1-3 months ago 4-6 months ago 7-12 months ago More than 1 year ago Don't know 1 tingala hinde 1-3 tingalugala hinde 4-6 tingalugala hinde 7-12 tingalugala hinde 1 varshakinta hechhu gottilla	
j29filterreplacecost	input, integer, <1000	5.10.3 How much did it cost? (Rs) Note: Enter 99 for don't know. 5.10.3 adara kharidige bele eshtagittu? (ru) tippani: gottilladiddare 99 annu bareyiri.	□□□
j30filterelectric	select1, string 1 0 99	*(Note: If other commercial filter)* 5.10.4 Does your filter use electricity in order to operate? 5.10.4 nimma sosuva patre yannu chalaisalu vidyuttannu upayogisuttira? Yes No DK	□

Section 6: Sanitation and hygiene practices

upa bhaga 6: Shouchalaya mattu nairmalyada kuritu

t10latrinepriv	select1, string 1 0	6.1 Currently, do you use a private latrine? 6.1 eega, neevu swanta shouchalaya upayogisuttiddira? Yes (Skip to 6.4) No	□
t11latrinepub	select1 string 1 0	*(Note: If 6.1 is 0)* 6.2 Currently, do you have access to a public latrine? 6.2 eega nimage sarvajanika shouchalaya saulabhyavideya? Yes No (Skip to 6.5)	□
t12latrinewalk	input int, <100	*(Note: If 6.2 is 1)* 6.3 How long does it take for you to walk to the public latrine? (minutes) Note: Enter 99 for if don't know. 6.3 sarvajanika shouchalayakke nadedukondu hogalu eshtu samayava aaguuttade? (nimishadalli) tippani: gottilladiddare 99 annu bareyiri.	□□
t13latrineshare	input int, <1000	*(Note: If 6.1 is 1 OR 6.2 is 1)* 6.4 How many households share the latrine? Note: Enter 99 for if don't know. 6.4 adannu eshtu kutumbagalu hanchikondiddiri? tippani: gottilladiddare 99 annu bareyiri.	□□
t14poop_multi_	select, string	6.5 Where does your oldest child under 5 usually defecate? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned.	

		6.5 aidu varshada valagina ellariginta hiriya magu elli mala visarjanaeyannu maduttade? tippani: avaru heluvatanaka kayiri, nivu aikegalannu oodabedi	
	private	Private or public latrine (Yes=1, No=0) (Skip to 6.7) vayaktika athava sarvajanika shouchalaya (Yes=1, No=0)	☐
	potty	Potty (Yes=1, No=0) potty (Yes=1, No=0)	☐
	inhouse	Elsewhere inside the house (Yes=1, No=0) maneyalliye yelladaru (Yes=1, No=0)	☐
	yard	Own yard (Yes=1, No=0) swanta jagadalli (Yes=1, No=0)	☐
	open	Open space other than own yard (Yes=1, No=0) bereyavara/sarvajanika khali bittiruva jagadalli (Yes=1, No=0)	☐
	gutter	Gutter/ditch outside the house (Yes=1, No=0) charandi/manaya horagiruva gundi (Yes=1, No=0)	☐
	bush	Bush/field (Yes=1, No=0) kanti/hola (Yes=1, No=0)	☐
	other	Other (Yes=1, No=0) itare (Yes=1, No=0)	☐
	dk	Don't know (Yes=1 No=0) (Skip to 6.7) gottilla (Yes=9, No=0)	☐
t15poopdispose_multi	select, string	(*Note: Relevant* ***poop_multi*** *NOT 'private' and NOT 'dk' and NOT 'gutter'*) 6.6 What do you usually do with the feces? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned. 6.6 neevu samanyavagi makkala sandasannu enu maduttira? tippani: avaru heluvatanaka kayiri, nivu aikegalannu oodabedi	
	toilet	Put/rinsed into toilet or latrine (Yes=1, No=0) shouchalayadalli hakuvudu (Yes=1, No=0)	☐
	gutter	Put/rinsed into gutter or ditch (Yes=1, No=0) charandiyalli hakuvudu (Yes=1, No=0)	☐

	trash	Thrown into garbage (Yes=1, No=0) kasadabutteyalli hakuvudu (Yes=1, No=0)	
	nothing	Nothing (Yes=1, No=0) enu illa (Yes=1, No=0)	
	other	Other (Yes=1, No=0) itare (Yes=1, No=0)	
	dk	Don't know (Yes=9, No=0) gotilla (Yes=1, No=0)	
t16allpoopwhere_multi	select, string	6.7 Where do children in the neighborhood usually defecate? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned 6.7 akka-pakkadamanae makkalu yelli mala visarjane maduttarae? tippani: avaru heluvatanaka kayiri, nivu aikegalannu oodabedi	
	none	No other children in the neighborhood (Yes=1, No=0) (Skip to 6.9) pakkadamane makkalu yaru illa (Yes=1, No=0)............................	
	private	Private or public latrine (Yes=1, No=0) (Skip to 6.9) vayaktika athava sarvajanika shouchalaya (Yes=1, No=0)	
	potty	Potty (Yes=1, No=0) potty (Yes=1, No=0)	
	inhouse	Elsewhere inside the house (Yes=1, No=0) maneyalliye yelladaru (Yes=1, No=0)	
	yard	Own yard (Yes=1, No=0) swanta jagadalli (Yes=1, No=0)	
	open	Open space other than own yard (Yes=1, No=0) bereyavara/ sarvajanika khali bittiruva jagadalli (Yes=1, No=0)	
	gutter	Gutter/ditch outside the house (Yes=1, No=0) charandi/manaya horagiruva gundi (Yes=1, No=0)	
	bush	Bush/field (Yes=1, No=0) kanti/hola (Yes=1, No=0)	
	other	Other (Yes=1, No=0) itare (Yes=1, No=0)	

	dk	Don't know (Yes=1 No=0) (Skip to 6.9) gottilla (Yes=9, No=0)	
t17allpoopdispose_multi_	select, string	(Note: Relevant **t16allpoop_multi_**NOT 'private' and NOT 'none' and NOT 'dk' and NOT 'gutter') 6.8 What is usually done with the feces? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned 6.8 samanyavagi makkala sandasannu enu maaduttare? tippani: avaru heluvatanaka kayiri, nivu aikegalannu oodabedi	
	toilet	Put/rinsed into toilet or latrine (Yes=1, No=0) shouchalayadalli hakuvudu (Yes=1, No=0)	
	gutter	Put/rinsed into gutter or ditch (Yes=1, No=0) charandiyalli hakuvudu (Yes=1, No=0)	
	trash	Thrown into garbage (Yes=1, No=0) kasadabutteyalli hakuvudu (Yes=1, No=0)	
	nospec	Clean it (no specific method reported) (Yes=1, No=0) swacchamaaduttare (yavudadaru ondu reeti) (Yes=1, No=0)	
	nothing	Nothing (Yes=1, No=0) enu illa (Yes=1, No=0)	
	other	Other (Yes=1, No=0) itare (Yes=1, No=0)	
	dk	Don't know (Yes=9, No=0) gotilla (Yes=1, No=0)	
t18hw_multi	select, string soap deter ash mud water	6.X What do you use to wash your hands? 6.X nimma kai toleyalu neevu enannu balasutteeri? Soap (hand soap, body soap, dettol) Detergent (clothes detergent, dishwashing detergent, other detergent) Ash Mud	

	other soap deter ash mud water other	Only water Other soap (kai toleyuva soap,mai toleyuva soap,dettol) bille (batte toleyuva bille,patre toleyuva bille,itare) boodi mannu neeru matra itare	
t18soapbuy	input int, <100	*(Note: If 6.X is 'soap')* 6.9 How often do you buy soap? (days) Note: Enter 99 for if don't know. 6.9 eshtu dinakomme neevu soap khareedisuttiri? (divasagalu) tippani: gottilladiddare 99 annu bareyiri.	□□
t19soapbuynum	input int, <100	*(Note: If 6.X is 'soap')* 6.10 How much soap did you buy last time you bought soap? Note: Enter 99 for if don't know. 6.10 kaleda sala eshtu soap khareedisidiri? tippani: gottilladiddare 99 annu bareyiri.	□□
t20soapbuyunit	select1, string 1 2	6.11 What unit was that given in? 6.11 adu yava pramanadalli kottaru? Cakes Bags	□

	3 4 1 2 3 4	Bottles Other cake cheela/plastic baatali itare	
		Section 7: Household assets **upa bhaaga 7. mane hagu aasti**	
k10hhassets1_multi_	select all	7.1 Does your household (or any member of your household) have: Note: Read ALL options. 7.1 nimma maneyalli athava nimma maneya sadasyaru ivagalannu hondiddareye? tippani: yella aikegalannu odiri.	
k10hhassets1_multi_almirah	almirah	Godrej or almirah (Yes=1, No=0) almeera (Haudu=1, Illa=0)	□
k10hhassets1_multi_table	table	Dining table (Yes=1, No=0) dining table (Haudu=1, Illa=0)	□
k10hhassets1_multi_chair	chair	Chair or bench (Yes=1, No=0) kurchi atava kulitukolluva aasana (Haudu=1, Illa=0)	□
k10hhassets1_multi_tv	tv	Television that is working (Yes=1, No=0) TV (karyaniratavagideye) (Haudu=1, Illa=0)	□
k10hhassets1_multi_cddvd	cddvd	CD or DVD player (Yes=1, No=0) CD or DVD player (Haudu=1, Illa=0)	□
k10hhassets1_multi_none	none	None (Yes=1, No=0) enu illa (Haudu=1, Illa=0)	□
	select all	7.2 Does your household (or any member of your household) have: Note: Read ALL options. 7.2 nimma maneyalli athava nimma maneya sadasyaru ivagalannu hondiddareye? tippani: yella aikegalannu odiri.	

k11hhassets2_multi_grinder	grinder	Grinder (Yes=1, No=0) mixer (Haudu=1, Illa=0)	☐
k11hhassets2_multi_fridge	fridge	Refrigerator (Yes=1, No=0) fridge (Haudu=1, Illa=0)	☐
k11hhassets2_multi_mobile	mobile	Mobile phone (Yes=1, No=0) mobile phone (Haudu=1, Illa=0)	☐
k11hhassets2_multi_livestock	livestock	Cows/Buffalo/Sheep/Goats (Yes=1, No=0) aakalu/aadu (Haudu=1, Illa=0)	☐
k11hhassets2_multi_none	none	None (Yes=1, No=0) enu illa (Haudu=1, Illa=0)	☐
	select all	7.3 Does your household (or any member of your household) have: Note: Read ALL options 7.3 nimma maneyalli athava nimma maneya sadasyaru ivagalannu hondiddareye? tippani: yella aikegalannu odiri.	
k12hhassets3_multi_cycle	cycle	Cycle (Yes=1, No=0) cycle (Haudu=1, Illa=0)	☐
k12hhassets3_multi_bike	bike	Bike/scooter (Yes=1, No=0) dwichakra vahana (Haudu=1, Illa=0)	☐
k12hhassets3_multi_rick	rick	Auto-Riksha (Yes=1, No=0) auto-Riksha(Yes=1, No=0)	☐
k12hhassets3_multi_car	car	Car (Yes=1, No=0) car (Haudu=1, Illa=0)	☐
k12hhassets3_multi_cart	cart	Cart(Yes=1, No=0) ettinagadi athava kuduregadi (Haudu=1, Illa=0)	☐
k12hhassets3_multi_vehicle	vehicle	Lorry/jeep/van (Yes=1, No=0) 6 chakra vahana/jeep (Haudu=1, Illa=0)	☐
k12hhassets3_multi_none	none	None (Yes=1, No=0) enu illa (Haudu=1, Illa=0)	☐
	select all	*(Note: If yes to cows/buffalo/sheep/goats in 7.2)* 7.4 What water sources do you use to maintain your cows/buffalo/sheep/goats? Note: Ask until nothing else mentioned. Check ALL mentioned.	

		7.4 nimma maneyalli iruva akalu/aadu galannu yava neerininda toleyuttiri? tippani: kelkanda vastuvannu gurutu maduava modalu gurutisi.	
k13water4cows_multi_borewell	borewell	Borewell or open well water(Yes=1, No=0) borewell athava teradiruva baviya neeru (Haudu=1, Illa=0)	□
k13water4cows_multi_cwsalt	cwsalt	Corporation salty piped water (Yes=1, No=0) corporation uppina neeru (Haudu=1, Illa=0)	□
k13water4cows_multi_tank	tank	Tank water (Yes=1, No=0) tank neeru (Haudu=1, Illa=0)	□
k13water4cows_multi_cw	cw	Corporation sweet water (Yes=1, No=0) corporation sihi neeru (Haudu=1, Illa=0)	□
k13water4cows_multi_lake	lake	Lake water (Yes=1, No=0) kere neeru (Haudu=1, Illa=0)	□
k13water4cows_multi_other	other	Other (Yes=1, No=0) itare (Haudu=1, Illa=0)	□
k01almirah	select1, string 0 1 2 3 4 5 99	7.4 How many of the following does your household have? Godrej or almirah 7.4 nimma maneyalli athava nimma maneya sadasyaru eshtu ivagalannu hondiddareye? almeera 0 1 2 3 4 5 Don't know	□
k02table	select1, string 0 1 2 3 4 5	Dining table dining table 0 1 2 3 4 5	□

	99	Don’t know	
k03chair	select1, string 0 1 2 99	Chair or bench kurchi atava kulitukolluva aasana 0 1 More than 1 Don’t know	□
k04tv	select1, string 0 1 2 3 4 5 99	Television that is working TV (karyaniratavagideye) 0 1 2 3 4 5 Don’t know	□
k05cddvd	select1, string 0 1 2 3 4 5 99	CD or DVD player that is working CD or DVD player (karyaniratavagideye) 0 1 2 3 4 5 Don’t know	□

k06grinder	select1, string 0 1 2 3 4 5 99	Grinder that is working Mixer (karyaniratavagideye) 0 1 2 3 4 5 Don't know	
k07fridge	select1, string 0 1 2 3 4 5 99	Refrigerator that is working fridge (karyaniratavagideye) 0 1 2 3 4 5 Don't know	
k08mobile	select1, string 0 1 2 3 4 5 6 99	Mobile phone that is working mobile phone (karyaniratavagideye) 0 1 2 3 4 5 More than 5 Don't know	
k09livestock	Input, int	7.4.1 How many of the following does your household have? Cows/Buffalo/Sheep/Goats 7.4.1 nimma maneyalli athava nimma maneya sadasyaru eshtu ivagalannu hondiddareye? aakalu/aadu	

k09livestock	select1, string 0 1 2 99	Cows/Buffalo/Sheep/Goats aakalu/aadu 0 1 More than 1 Don't know	
k12acycle	select1, string 0 1 2 3 4 5 99	Bicycle cycle 0 1 2 3 4 5 Don't know	
k12bbike	select1, string 0 1 2 3 4 5 99	Bike/scooter dwichakra vahana 0 1 2 3 4 5 Don't know	
k12crick	select1, string 0	Auto-Riksha auto-Riksha 0	

	1	1	
	2	2	
	3	3	
	4	4	
	5	5	
	99	Don't know	
k12dcar	select1, string	Car car	
	0	0	
	1	1	
	2	2	
	3	3	
	4	4	
	5	5	
	99	Don't know	
k12evehicle	select1, string	Lorry/jeep/van/tractor chakra vahana/jeep/tractor	
	0	0	
	1	1	
	2	2	
	3	3	
	4	4	
	5	5	
	99	Don't know	
k12fcart	select1, string	Cart ettinagadi athava kuduregadi	
	0	none	
	1	1	
	2	2	
	3	3	
	4	4	

	5 99	5 Don't know	
k14pplwincome	input, integer, <20	7.5 How many people who live in this household earn an income? Enter 99 if don't know. 7.5 ee maneyalli eshtu janaru aadaya galisuttare? gottilladiddare 99 anta bareyiri	□
Note: Question 7.6 – 7.8 should repeat for a maximum of at least 4 income earners.			
k15incomep1 **k18incomep2** **k21incomep3** **k24incomep4**	input, integer, <1000000	*(Note: If 7.5 is 1 – 4)* 7.6 (How much does the (first/second/third/fourth) person earn? (Ru.) Note: If they give a total for the household then enter it for the first individual and enter "0" for all other individuals. Enter 99 if don't know. 7.6 modalane/eradene/moorane/nalkane vyaktiya adaya? (ru) tippani:avaru tamma maneya ottu adya kottare ondane sadasya jagadalli ottu hana baredu bere sadasyara jagadalli 0 anta bareyiri, avarige gottilladiddare 999999 anta bareyiri.	□□□□□□
k16incomep1units **k19incomep2units** **k22incomep3units** **k25incomep4units**	select1, string 1 2 3	*(Note: If 7.5 is 1 – 4)* 7.7 What was the amount given in: 7.7 aadayavu yavadaralli kottiddare? Days Months	□

	1 2 3	Year divasa tingalu varsha	
k17incomep1units2 **k20incomep2units2** **k23incomep3units2** **k26incomep4units2**	input, integer	*(Note: If 7.5 is 1 – 4 and 7.7 is 1)* 7.8 How many days per week? (days) 7.8 varada eshtu divasagalu? (divasa)	□
k27incometotal	input, integer, <1000000	7.9 What is your household's total income, including any remittances you receive? (Ru.) Note: Enter 99 if don't know 7.9 nimma maneya ottu aadaya eshtu, bere kadeyinda banda adayavannu serisi? (Ru.) tippani: gottilladiddare 99 anta bareyiri	□□□□□□
sk27aincometotalunit	select1, string 1 2 3 1 2 3	7.7 What was the amount given in: 7.7 aadayavu yavadaralli kottiddare? Days Months Year divasa tingalu varsha	□
k28houses	select1, string	7.10 How many houses do you own?	□□

	 0 1 2 3 99 0 1 2 3 99	7.10 neevu eshtu manegala malikaragiddiri? 0 house 1 house 2-5 houses More than 5 houses Don't know 0 mane 1 mane 2-5 mane 5 manegaliginta hechhu gottilla	
k29rooms	input, integer	7.11 How many rooms are there in this house, excluding kitchen and bathrooms? <u>Enter 99 if don't know.</u> 7.11 nimma maneyalli adigemane mattu bachhala mane bittu eshtu koonegalu ide? <u>gottilladiddare 99 anta bareyiri</u>	□□
k30fields	select1, string 1 0	7.12 Does your family own any agricultural fields? 7.12 neevu hola galannu hondiddira? Yes No	□
k31fueltype	select1, string wood dung coal kerosene electric lpg	7.13 What type of fuel does your household mainly use for cooking? 7.13 aduge madalu pramukhavagi yaava tarahada indhana balasutteeri? Wood Dung cakes Charcoal Kerosene Electric heater	□

	other dk wood dung coal kerosene electric lpg other dk	LPG cylinder Other Don’t know kattige sagani iddilu seeme enne vidhyut shakti adige anila itare gottilla	
Section 8. Water-handling **upa bhaga 8. neerina balake**			
l10tapshow	select1, string 1 0	8.1 ASK: Could you show me where you obtain drinking water from presently? 8.1 KELI: eega neevu neerannu yellinda padeyuviri anta namage torisuvira? Yes No	☐
l11taploc	select1, string indoor outdoor nothere other dk indoor outdoor nothere	*(Note: If 8.1 is 1, OBSERVE, if 8.1 is 2, ASK)* 8.2 (OBSERVE/ASK) Where is the tap located? 8.2 (VEEKSHISI / KELI): nimma maneya nala elli ide? Indoor tap Outdoor tap within premises Tap not on premises Other Don’t know/Could not observe maneyolagina nala maneya aavaranadalli	

	other dk	maneya aavaranada horagade itare gottilla/ noodalu sadyavagilla	
l12tapmouth	select1, string elevate ground tank gutter other dk elevate ground tank gutter other dk	*(Note: If 8.1 is 1, and 8.2 is 1 or 2, OBSERVE, if not ASK)* 8.3 (OBSERVE/ASK): Where is the mouth of the tap located? 8.3 (VEEKSHISI / KELI): nalada baiyi elli ide? Elevated from the ground (Skip to 8.6) On the ground (Skip to 8.5) Inside a concrete or underground tank Inside a gutter Other (Skip to 8.6) Don't know/Could not observe (Skip to 8.6) neladinda ettarakke ide neleda mele ide concrete olage athava neeru tumbisuva neladolagina tank alli ide charandiyalli ide itare gottilla/ noodalu sadyavagilla	
l12tapmouth	select1, string elevate ground tank gutter other dk elevate ground tank gutter	8.3 (ASK): Where is the mouth of your drinking water tap located? 8.3 (KELI): kudiyalu balasuva neerina nalada baiyi elli ide? Elevated from the ground (Skip to 8.6) On the ground (Skip to 8.5) Inside a concrete or underground tank Inside a gutter Other (Skip to 8.6) Don't know/Could not observe (Skip to 8.6) neladinda ettarakke ide neleda mele ide concrete olage athava neeru tumbisuva neladolagina	

	 other dk	tank alli ide charandiyalli ide itare gottilla/ noodalu sadyavagilla	
l13tapbackflow	select1, string 1 0	*(Note: If 8.3 is tank)* 8.4 ASK: In the last month, has this tank/gutter filled above the level of this tap? 8.4 KELI: hoda tingalu, ee tank/charandi nalli nalada baiyigintha mele neeru tumbisiddira? Yes (Skip to 8.6) No (Skip to 8.6)	☐
l14tapstreet	select1, string 1 0	*(Note: If 8.3 is ground)* 8.5 ASK: In the last month, has the street flooded above the level of this tap? 8.5 KELI: hoda tingalu, yavagladaru kolache neeru athava male neeru ee nalada baiyigintha mele bandideya? Yes No	☐
l15tapsize	input, integer, <100	8.6 MEASURE: What is the perimeter of the pipe serving the tap? (cm) Note: Enter 99 if not able to measure. 8.6 ALEYIRI: nalakke hattiruva pipina ottu gatra eshtu? (cm) tippani: aleyalagadiddare 99 anta bareyiri.	☐☐
Storing Drinking and Cooking Water			
l16storesee	select1, string	8.7 ASK: May I see the containers where you store water used for drinking and/or cooking? Note: If more than one kitchen is present, only go to one of the kitchens.	☐

	    1 0 3 1 0 3	8.7 KELI: nanu neevu kudiyuva haagu aduge madalu upayogisuva neerina patregalannu nodabahuda? tippani: ondakinta hechhu aduge mani iddare onde aduge manige hogiri. Yes No (Skip to 8.8) I don’t store drinking/cooking water (Skip to 8.8) haudu illa nanu kudiyulu athava aduge madalu neerannu sangrahisudilla	
l17morekitchen	input, integer	*(Note: If 8.7 is 1)* 8.7.1 ASK: How many kitchens do you have where you store drinking water? 8.7.1 KELI: nimma maneyalli kudiyuva haagu adige madalu upayogisuva neerannu tumbikonda esthu aduge manegalive?	□
l18getglass	select1, string 1 0 2	8.8 ASK: Could you give me a glass of water the same way that you would collect it for your children under five if they asked for a drink? 8.8 KELI: nimma 5 varushada valagina maguvige neerannu koduva reetiyalli nanage ondu glass neeru kodi? Yes No (Skip to 8.18) Child too young for water/magu neeru kudiyalagadastu sanna vayassinadagiruttade (Skip to 8.18)	□
l19ggwhere	select1, string	*(Note: If 8.8 is 1)*	

	storage treated plastic bottled tap dk storage treated plastic bottled tap dk	8.9 OBSERVE: Where did the water come from? 8.9 VEEKSHISI: neerannu ellinda tandiddare? Storage container Water directly from filter Plastic bottle Bottled water tap Tap Don't know/Could not observe patreyalli sangrahisida neeru neerannu shuddikarisuva yantragalinda plastic bataliyinda batali neerina nala (sujal water) nala gottilla/ noodalu sadyavagilla	
l20ggtap	select1, string 1 0	*(Note: If 8.9 is "tap" and they have an overhead tank)* 8.10 ASK: Did the tap water come from an overhead tank? 8.10 KELI: naladu neeru mahadi melina tank inda baruttadeye? Yes No	□
l21gghow	select1, string dip charigi ladle pour tap other dk	8.11 OBSERVE: How did he/she get the water? 8.11 VEEKSHISI: avanu/avalu neerannu hege tandaru? Dipped cup in container Dipped charigi in container Ladled from container Poured from container Filled from tap Other Don't know/Could not observe	

	dip charigi ladle pour tap other dk	patreyalli lotavannu mulugisi neerannu tegedaru charigeyinda neerutumbi lotadalli hakidaru hidi iruva patrehinda mulugisi neerannu tegedaru patreyannu baggisi neerannu tegedaru naladinda neerannu tumbidaru itare gottilla/ noodalu sadyavagilla	
l22ggsample	select1, string 1 0	*(Note: If taking a sample)* 8.12 ASK: Could I take a sample of your drinking water? 8.12 KELI: nanu swalpa kudiyuva neerannu tagedukollabahude? Yes No	☐
l23ggcover	select1, string 1 0 99	*(Note: If 8.9 is storage)* 8.13 OBSERVE: Is this container covered? 8.13 VEEKSHISI: ee patreyannu mucchidareye? Yes No DK	☐
l24ggground	select1, string 1 0 99	*(Note: If 8.9 is storage)* 8.14 OBSERVE: Is this container on the ground? 8.14 VEEKSHISI: ee patreyu nelada mele ideye? Yes No DK	☐
l25ggtreat	select1, string	*(Note: If 8.9 is storage or plastic)*	☐

	1 0	8.15 ASK: Have you done anything to this water to make it better to drink? 8.15 KELI: neevu ee neerina gunamatta hechhisalu enadaru madiddira? Yes No	
l26ggtype	select1, string sc sm sp pd pm cm ch clm oth sc sm sp pd pm cm ch clm oth	8.16 OBSERVE: What is this container type? 8.16 VEEKSHISI: ee patre kelakanda yava vargakke seriddu? Steel cylinder Steel matka Steel patre Plastic drum Plastic matka Copper matka Copper hande Clay matka Other steel kolaga steel koda steel patre plastic drum plastic koda tambrada koda tambrada hande mannina koda Itare patre	
l27storage		8.17 Note: During the next few questions point to their drinking and cooking water storage containers. 8.17 Tippani: Kudiyuva hagu aduge maduva neerannu sangrahisuva patregala bagge mundina prashnegalalli kelalaguvudu.	

n10storewhatw_	select all	*(Note: if any secondary source of water is reported)* 8.18 ASK: Do you have the following kinds of water in these containers? <u>Note: Read ALL options. Ask until nothing else mentioned. Check ALL mentioned.</u> 8.18 KELI: ee patregalalli kelage suchisida yava tarahada neeru idea? <u>tippani: avaru heluva tanaka kayiri. heladiddalli ella aikegalannu odiri.</u>	
n10storewhatw_multi _well	well	Borewell or open well water(Yes=1, No=0) borewell athava terediruva bavi neeru(Haudu=1, Illa=0)	□
n10storewhatw_multi _cwsalt	cwsalt	Corporation salty piped water (Yes=1, No=0) corporation uppina neeru (Haudu=1, Illa=0)	□
n10storewhatw_multi _tank	tank	Tank water (Yes=1, No=0) tank neeru (Haudu=1, Illa=0)	□
n10storewhatw_multi _cw	cw	Corporation sweet water (Yes=1, No=0) corporation sihi neeru (Haudu=1, Illa=0)	□
n10storewhatw_multi _other	other	Other (Yes=1, No=0) itare (Haudu=1, Illa=0)	□
n11storefill	select1, string 1 2 3 4 5 6 99 1 2 3 4	*(Note: If taking a sample in the household)* 8.18.1 ASK: How many days ago was this container filled with water? 8.18.1 eshtu divasagala hinde ee patreyalli neerinnu tumbiddiri? Today Yesterday 2 days ago 3 days ago 4-6 days ago 7 or more days ago Don't know ivattu ninne monne	□□

	5	3 divasagala hinde	
	6	4-6 divasagala hinde	
	99	7 athava adakinta hechhina divasagala hinde	
		gottilla	
n11storehowfill_	select all	8.19 Last time that you filled them, how did you fill these containers? Note: Read ALL options. 8.19 keledasala neevu neerannu tumbuvaga kelagina yava salakaraneyannu upayogisiddiri? tippani: yella aikegalannu odiri.	
n11storehowfill_multi_pots	pots	With pots (Yes=1, No=0) kodagala moolaka (Haudu=1, Illa=0)	☐
n11storehow_multi_pipe	pipe	From pipe attached to tap (Yes=1, No=0) Nalakke hachhida pipina moolaka (Haudu=1, Illa=0)	☐
n11storehow_multi_tap	tap	From the tap directly (Yes=1, No=0) neravagi naladinda(Haudu=1, Illa=0)	☐
n12storetime	select1, string	8.20 The last time you collected Corporation sweet water, how long did it take to go to the tap, fill all containers and come back? 8.20 hoda sala neevu nimage sakaguvastu neeru tumbikondu taralu(hogi baralu,palegagi kayalu) eshtu samayavannu tegedukondiddiri?	
		0 minutes to 30 minutes	
	1	More than 30 minutes up to 1 hour	
	2	More than 1 hour up to 2 hours	
	3	More than 2 hours, up to 3 hours	
	4	More than 2 hours, up to 3 hours	
	5	More than 4 hours	
	6	Don’t know	
	99		
		0 rinda 30 nimisha	
	1	30 nimishakinta hechhu ondu ghanteyavarege	
	2	Ondu ghanteginta hecchu 2 ghanteyavarege	
	3	2 ghanteginta hecchu 3 ghanteyavarege	
	4	3 ghanteginta hecchu 4 ghanteyavarege	

	5 6 99	4 ghantegintha hechhu gottilla	
n13storewhofill_	select all	*(Note: In non 24/7 only)* 8.21 Who in your household collects Corporation sweet water? Note: Read ALL options. 8.21 nimma maneyalli corporation neerannu yaru taruttare? tippani:yella aikegalannu odiri.	
n13storewhofill_multi_men	men	Men (Yes =1, No=2) gandasaru(Haudu =1, Illa=2)	☐
n13storewhofill_multi_women	women	Women (Yes =1, No=2) hennumakkalu (Haudu =1, Illa=2)	☐
n13storewhofill_multi_girls	girls	Girls (Yes =1, No=2) hudugiyaru (Haudu =1, Illa=2)	☐
n13storewhofill_multi_boys	boys	Boys (Yes =1, No=2) hudugaru (Haudu =1, Illa=2)	☐
n14afterfilling	select1, string lefton usedall off next	*(Note: In non 24/7 only)* 8.22 Last time the Corporation sweet water came, after you filled your storage containers, what did you do with the remaining water at the tap? Note: Read ALL options. 8.22 hodasala corporation neeru bandga, neevu ella patreyannu hosa neerininda tumbidamele naladalli baruva baki neerannu enu madiddiri? tippani:yalla aikegalannu odiri. Left it on Used it the entire time water was available Turned it off Next person used it	

	 lefton usedall off next	haage bittiddeve nala dalli banda ashtu neerannu tumbikondiddeve adannu band madiddeve bere mandi upayogisidaru	
N14bsufficienth2owet	select1, string 1 0 99	*(Note: In non 24/7 only)* 8.22.1 The last time corporation water came; did you have enough corporation water to fill up all of your containers? 8.22.1 Kaleda sala corporation sihi neeru bandaga, ella patregalannu tumbikollalu corporation neeru sakagitta? Haudu Illa Gottilla	
N14csufficienth2odry	select1, string 1 0 99	*(Note: In non 24/7 only)* 8.22.2 In the dry season when the corporation water comes, do you have enough corporation water to fill up all of your containers? 8.22.2 Besige kaladalli corporation sihi neeru bandaga, ella patregalannu tumbikollalu corporation neeru sakagitta? Haudu Illa Gottilla	
n15runout	select1, string	*(Note: In non 24/7 only)* 8.23 In the last month, did you ever run out of water in these containers?	□

	     1 0	8.23 kaleda ondu tingalalli, neevu ee patregalalli tumbikonda corporation neeru mattondu sala nala baruva modale khaliyagitta? Yes No (Skip to 8.28)	
n16runoutwhere	select1, string 1 2 3 4 5 6 7 1 2 3 4 5 6 7	*(Note: In non 24/7 only and if 8.23 is 1)* 8.24 Where did you get your drinking water? 8.24 Sakagadiddare kudiyuva neerannu yellinda tandidiri? Borewell water Water tank Water truck From overhead or underground tank Neighbor's stored water Piped borewell connection Other kolavebavi neeru neerina tank truck neeru mahadimelina /neladolagina tank neeru pakkadamaneyavaru sangrahisidda neeru pipegala moolaka kolavebaviya neeru itare	□
N17RunOutWhereOther	Input, string	8.24.1 ASK: ? 8.24.1 KELI: tanda neerannu kudiyuva modalu adannu suddikarisiddira?	
n18runouttreat	select1, string	*(Note: In non 24/7 only and if 8.23 is 1)*	□

	1 0	8.25 Did you treat this water before you drank it? 8.25 tanda neerannu kudiyuva modalu adannu suddikarisiddira? Yes No (Skip to 8.28)	
n19runouttreathow	select1, string boil cltab cloth candle pureit othercomm other boil cltab cloth candle pureit othercomm other	*(Note: In non 24/7 only and if 8.25 is 1)* 8.26 How did you treat it? <u>Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned.</u> 8.30 adannu hege suddikarisiddiri? <u>tippani:avaru heluvatanaka kayiri, nivu aikegalannu odabedi</u> Boil Add chlorine tablets Filter water through cloth Use steel filter/ ceramic candle filter Use PureIt/Aquasure Use other commercial filter Other kudisu chlorine guligeye balake neerannu batteinda sosuvudu steel filter/ kumbarikeya candle sosuva patre PureIt/Aqua guard na balake bere yavudadaru vyaparika sosuva patrey itare	□
n20runouttreatother		*(Note: If yes to "other" in 8.26)* 8.27 Specify other type:	

		8.27 itare spashtikarisi:	
n21storeremaining_	select all	8.28 What do you do with remaining water from these containers when you refill them? Note: Do NOT read options. Ask until nothing else mentioned. Check ALL mentioned. 8.28 ee patregalannu matte tumbuvaga, ulidiruva neerannu enu maduttiri? tippani: avaru heluvatanaka kayiri, nivu aikegalannu odabedi.	
n21storeremaining_ multi_throw	throw	Throw out (Yes=1, No=0) horage challu (Haudu=1, Illa=0)	☐
n21storeremaining_ multi_chores	chores	Use for domestic chores (Yes=1, No=0) dinacharige upayogisuttave (Haudu=1, Illa=0)	☐
n21storeremaining_ multi_garden	garden	Water my garden with it (Yes=1, No=0) totakke ee neerannu upayogisutteve (Haudu=1, Illa=0)	☐
n21storeremaining_ multi_none	none	There is no remaining water in storage containers (Yes=1, No=0) sangrahane patreyalli neeru iruvadilla (Haudu=1, Illa=0)	☐
n21storeremaining_ multi_other	other	Other (Yes=1, No=0) itare (Haudu=1, Illa=0)	☐
Storing Water for Bathing and Household Chores **Snana mattu dinacharigalu**			
p10domstore	select1, string 1 0	8.29 Apart from any overhead tanks or underground tanks, may I see your separate storage containers for washing and cleaning? 8.29 KELI: mahadimelina tank hagu neladolagina tank annu bittu nimma maneyalliruva bere sangrahane patre (snana, batte vagiyuvudu matte mani suchi golisalu upayogisuva neerina patregalu) galannu nodabahuda? Yes No (Skip to Section 9)	☐
p11domstorewhatw_	select all	8.30 Do you have the following kinds of water in these containers: Note: Read ALL options. Ask until nothing else mentioned. Check ALL mentioned.	

		8.30 KELI: ee patregalalli kelage suchisida tarahada neeru idea? tippani: avaru heluva tanaka kayiri. heladiddalli ella aikegalannu odiri.	
p11domstorewhatw_multi_well	well	Borewell or open well water(Yes=1, No=0) borewell athava terediruva bavi neeru(Haudu=1, Illa=0)	□
p11domstorewhatw_multi_cwsalt	cwsalt	Corporation salty piped water (Yes=1, No=0) corporation uppina neeru (Haudu=1, Illa=0)	□
p11domstorewhatw_multi_tank	tank	Tank water (Yes=1, No=0) tank neeru (Haudu=1, Illa=0)	□
p11domstorewhatw_multi_cw	cw	Corporation sweet water (Yes=1, No=0) corporation sihi neeru (Haudu=1, Illa=0)	□
p11domstorewhatw_multi_other	other	Other (Yes=1, No=0) itare (Haudu=1, Illa=0)	□
p12paperstorage		8.31 OBSERVE: Put your device to sleep and place it back in your bag. Take out the water storage container paper survey. When the water storage container paper survey is complete, then take out the device again and finish the survey. 8.31 VEEKSHISI: neerina sagrahane patreya paper survey maduva modalu nimma divice annu malagiruvante maadi nimma byag nalli ittukolli. neerina sagrahane patreya paper survey magida mele matte divice annu tegedu survey annu mugisiri.	
Section 9. Discrete Choice **upa bhaga 9.**			
R10ohtankvol	input, integer, <100000	*(Note: If 4.7.1 is 1 and 4.2.9 is <100)* 9.1 What is the total number of liters of overhead storage that you currently use? Note: Enter 99 if don't know 9.1 eega neevu balasuva mahadiya melina tank alli eshtu liter neeru tumba bahudu? tippani: gottilladiddare 99 antha bareyiri.	□□□□□
R11ugtank	select1, string	*(Note: If 4.2.9 is <100)* 9.2 Currently, do you store water in a closed underground storage tank?	□□

	1 0 99	9.2 eaga, neevu neladolage muchhida neeru sangrahane tank alli neerannu sangrahisutiddira? Yes No (Skip to 9.3) DK (Skip to 9.3)	
R12ugtankvol	input, integer, <1000000	*(Note: If 9.2 is 1 and 4.2.9 is <100)* 9.2.1 How many liters can you store in your underground tank/tanks? (liters) Note: Enter 99 for if don't know. 9.2.1 neladolagina tank galalli neevu eshtu litre neerannu sangrahisabahudu? tippani: gottilladiddare 99 annu bareyiri.	□□□□□
R13YeshtaKoda1	input, integer, <1000	*(Note: Non-24/7 only and if 4.2.9 is <100, 4.7.1 is not 1 and 9.2 is not 1)* 9.3.1 The last time the water came, how many koda did you collect? 9.3.1	□□□
R13YeshtaKoda2	input, integer, <1000	*(Note: 24/7 only and if 4.2.9 is <100, 4.7.1 is not 1 and 9.2 is not 1)* 9.3.2 Approximately how many koda do you use per day? 9.3.2	□□□
R14DCSetUp		9.4 Note: Take out the DC cards. Turn to the cards listed on your HH ID list. Read the instructions for the game. 9.4	□
R15Card1		9.5 Note: First Game: Enter the card number for choice-set 1	□
R16Price1		9.6 Note: First Game: Enter the price for choice-set 1	□
R17Card2		9.7 Note: First Game: Enter the card number for choice-set 2	□
R18Price2		9.8 Note: First Game: Enter the price for choice-set 2	□

R19BillEst1		9.9 Note: First Game: Monthly bill estimate for choice-set 1 is <MonthlyBIll1-1>. Monthly bill estimate for choice-set 2 is <MonthlyBIll1-2>	□
R20Prefer1		9.10 Note: First Game: Enter the card number that they prefer.	□
R21Card3		9.11 Note: Second Game: Enter the card number for choice-set 1	□
R22Price3		9.12 Note: Second Game: Enter the price for choice-set 1	□
R23Card4		9.13 Note: Second Game: Enter the card number for choice-set 2	□
R24Price4		9.14 Note: Second Game: Enter the price for choice-set 2	□
R25BillEst2		9.15 Note: Second Game: Monthly bill estimate for choice-set 1 is <MonthlyBIll2-1>. Monthly bill estimate for choice-set 2 is <MonthlyBIll2-2>	□
R26Prefer2		9.16 Note: Second Game: Enter the card number that they prefer.	□
R27Card5		9.17 Note: Third Game: Enter the card number for choice-set 1	□
R28Price5		9.18 Note: Third Game: Enter the price for choice-set 1	□
R29Card6		9.19 Note: Third Game: Enter the card number for choice-set 2	□
R30Price6		9.20 Note: Third Game: Enter the price for choice-set 2	□
R31BillEst3		9.21 Note: Third Game: Monthly bill estimate for choice-set 1 is <MonthlyBIll3-1>. Monthly bill estimate for choice-set 2 is <MonthlyBIll3-2>	□
R32Prefer3		9.22 Note: Third Game: Enter the card number that they prefer.	□
Section 10: Sanitation and Hand washing **upa bhaaga 10. swacchate haagu kai toleyuvike**			
q10hands	select1 string	10.1 ASK: Could you show me where you usually wash your hands? Note: Record the location that they show you.	□

	1 2 3 4 5 1 2 3 4 5	10.1 KELI: neevu yavagalu elli kai toliyuttira? torisi. tippani: nodida jagavannu daakhalisi. Inside the house Elsewhere in yard Outside yard No specific place (Skip to 10.6) No permission to see (Skip to 10.6) maneyolage maneya avaranadalli maneya avaranada horage elliyadaru torisudilla	
q11handswater	select1 string 1 0 99 1 0 99	*(Note: If 10.1 is 1, 2, or 3)* 10.2 OBSERVE: Is water available there for hand washing? 10.2 VEEKSHISI: kai toleyalu neeru ideya? Yes No Could not observe houdu illa noodalu sadyavagilla	□
q12asoaptime		*(Note: If 10.1 is 1, 2, or 3)* Note: Stand at the handwashing place when asking the question. 10.2.1 ASK: Can you show me the soap/detergent that you wash your hands with? 10.2.1 KELI: Nanage neevu kai toleyalu upayogisida soap/billeyannu torisabahude?	

	1 2 3 4 5 99 1 2 3 4 5 99	Soap/detergent present in handwashing place Soap/detergent brought quickly Soap/detergent brought after some minutes Soap/detergent not present in household No soap used for handwashing Refused to show soap/bille eega kai toleyuva jagadalli ide soap/billeyannu takshana tandaru soap/billeyannu swalpa samayada nantara tandaru soap/bille maneyalli ega illa enu illa torisalu nirakarisidaru	
q12asoap	select1 string 1 2 3 4 99 1 2 3 4 99	*(Note: If 10.1 is 1, 2, or 3)* 10.3 OBSERVE / ASK: Is there soap or detergent or locally used cleansing agent? 10.3 VEEKSHISI / KELI: sopu atava yavude kai toleyuva samagri idaveya? Soap Detergent None Other Could not observe sopu bille yavudu illa itare noodalu sadyavagilla	□
q12asoaploc	select1 string	*(Note: If 10.3 is 1 or 2)* 10.3.1 OBSERVE: Where is the soap/detergent located? 10.3.1 VEEKSHISI: soapu/bille elli ide?	

	1 2 1 2	At the place where they usually wash their hands At different place in household yavagalu kai toleyuva jagadalli maneya itare jagadalli	
q12bsoapused	select1 string 1 0	*(Note: If 10.3 is 1)* 10.4 OBSERVE: Does the soap look like it has been used? 10.4 VEEKSHISI: sopu upayogisida hage kaanuttidiye? Yes No	□
q12cwashveg	select1 string 1 2 3 4 5 1 2 3 4 5	10.5 ASK: Where do you wash vegetables? 10.5 KELI: nivu tarakariyannu yelli toleyutteeri? In yard Outside/Beside the house In the bathroom In the kitchen Other maneya avaranadalli maneya munde/hinde maneya valagiruva kai toleyaua jagadalli adige maneyalli itare	□
q12dwashspoon	select1 string 1 2 3 4 5	10.6 ASK: Where do you wash cooking utensils? 10.6 KELI: patregalannu elli toleyutteeri? In yard Outside/Beside the house In the bathroom In the kitchen Other	□

	1 2 3 4 5	maneya avaranadalli maneya munde/hinde maneya valagiruva kai toleyaua jagadalli adige maneyalli itare	
q12toilet	select1 string 1 0 2 3 1 0 2 3	10.7 ASK: If you have a private toilet, may I observe your toilet facility? 10.7 KELI: nivu vayaktika shouchalavannu balasuttidare adannu nanu nodabahude? Yes No (Skip to 10.10) No private toilet (Skip to 10.10) Not in use (Skip to 10.10) haudu illa vayaktika shouchalaya illa shouchalaya ide adare balasutilla	□
q13atoilettype_multi	multi-select flush pflush pitslab pitnoslab other flush pflush pitslab pitnoslab	*(Note: If 10.7 (**q12toilet**) is 1)* 10.8 OBSERVE: What type of latrine is it? 10.8 VEEKSHISI: e shouchalaya yava vidhadagide? Flush toilet Pour flush toilet Pit latrine with slab Pit latrine without slab Other flush shouchalaya pour flush shouchalaya kulitukollalu plastic athava cement asana hondida pit shouchalaya	□

	other	kulitukollalu plastic athava cement asana hondada pit shouchalaya itare	
q13toiletdirty	select1 string 1 0 99 0 1 99	*(Note: If 10.7 is 1)* 10.9 OBSERVE: Is stool visible on the slab or floor? 10.9 VEEKSHISI: sandas settina suttalalli mala kanuttidiye? Yes No Could not observe haudu illa noodalu sadyavagilla	□□
q14aftertoilet	select1 string 1 2 3 4 5 6 1 2 3 4 5 6	10.10 ASK: Could you show me where you usually wash your hands after you use the toilet? Note: Record the location that they show you. 10.10 KELI: shouchalakke hogibanda mele samanyavagi neevu elli kai toliyuttira? torisi. tippani: nodida jagavannu daakhalisi. Same location as before (Skip to 10.13) Inside the house Elsewhere in yard Outside yard No specific place (Skip to 10.13) No permission to see (Skip to 10.13) modalu toleyuttidda jaagadalii maneyolage maneya avaranadalli maneya avaranada horage elliyadaru torisudilla	□

q15aftertoiletwater	select1 string 1 0 99 1 0 99	*(Note: If 10.10 is 2, 3, or 4)* 10.11 OBSERVE: Is water available there for hand washing? 10.11 VEEKSHISI: kai toleyalu neeru ideya? Yes No Could not observe houdu. illa noodalu sadyavagilla	□
q15aftertoiletsoap	select1 string 1 2 3 4 99 1 2 3 4 99	*(Note: If 10.10 is 2, 3, or 4)* 10.12 OBSERVE: Is there soap or detergent or locally used cleansing agent? 10.12 VEEKSHISI: sopu atava yavude kai toleyuva samagri idaveya ? Soap Detergent None Other Could not observe sopu bille yavudu illa itare noodalu sadyavagilla	□
q15aftersoaploc	select1, string	*(Note: If 10.12 is 1 OR 2)* 10.12.0 VEEKSHISI: Where is the soap/detergent located?	□

	 1 2 3 1 2 3	10.12.0 VEEKSHISI: soapu/bille elli ide? At the place where they wash their hands after using bathroom At the place where they usually wash their hands At different place in household souchalaya upayogisida nantara kai toleyuva jagadalli yavagalu kai toleyuva jagadalli maneya itare jagadalli	
q15aftersoapused	select1 string 1 0	*(Note: If 10.12 is 1)* 10.12.1 OBSERVE: Does the soap look like it has been used? 10.12.1 VEEKSHISI: sopu upayogisida hage kaanuttidiye? Yes No	□
q15drain	select1 string 1 2 3 4 5 99 1 2 3 4 5 99	*(Note: If 10.7 (**q12toilet**) is 1 or 2)* 10.13 ASK: What kind of drainage system does your toilet drain to? 10.13 KELI: nimma maneya shouchalayakke yava tarahada charandi saulabhya ide? Piped sewers, septic tank or pit Open drain (Skip to 10.15) Nala (Skip to 10.15) No drainage system (Skip to 10.17) Other (Skip to Section 10.17) Don't know (Skip to Section 10.17) paipina saulabhya, septic tank athava pit tereda charandi nala yavudu charandi illa itare	□

		gotilla	
q15sewerback	select1 string 1 0	*(Note: if 10.13 is 1 (piped))* 10.14 ASK: In the last month, has the piped sewer ever backed into your house? 10.14 KELI: hindina tingalalli paipina charandi tumbi hindirugi bandideya? Yes (Skip to 10.17 No (Skip to 10.17	
q15trash	select1, string 1 2 3 4 5 6 7 8 9 10 99 1 2 3 4 5 6 7 8 9 10	10.17 ASK: Where do you dispose of the household garbage? 10.17 KELI: neevu elli maneya kasavannu chellutiri? In open heap in front of/near the house In open heap in the neighborhood In specified garbage bin provided by HDMC/Corporation In open drain/nala Any open place (not specific) Compost pit Burnt in front of/near the house (Skip to 10.19) Burnt in the neighborhood (Skip to 10.19) Collected at the door (Skip to 10.19) Other Don't know (Skip to 10.19) maneya mundiruva/hattiraviruva kasachelluva stala oniyalliruva/maneyinda dooradalliruva kasachelluva stala HDMC/Corporation ittiruva kasada buttiyalli tereda charandiyalli/naladalli bere yavudadaru sarvajanika staladalli maneya avaranadalliruva kasada gundiyalli maneya munde/ hattira suttu hakuvadu oniyalli/maneyinda dooradalli suttu hakuvadu mane bagilige bandu kasa sangrahisuvavarige koduvudu itare	

	99	gottilla	
q15trashclear	select1, string 1 0 99	*(Note: If 10.17 (**q15trash**) is NOT 7, 8, 9, 99)* 10.18 ASK: Is the garbage cleared/collected from that location regularly by municipal workers or others? 10.18 KELI: municipal kelasagararu athava bere yaradaru yavagalu bandu kasa tegedukondu hoguttreye? Yes No Don't Know	
q15trashoften	select1, string 1 2 3 4 5 6 7 99 1 2 3 4 5 6 7 99	*(Note: If 10.17 (**q15trash**) is 9 OR 10.18 (**q15trashclear**) is 1)* 10.19 How often is the garbage collected? 10.19 eshtu dinakomme kasa sangrahane/swachha madalaguttade? Once a day Once a week A few times in a month Once a month A few times in a year Once a year Only when we make complaint Don't know prati dinakomme varakomme tingalalli kelavu sala tingaligomme varshadalli kelavu sala varshakomme navu dooru needidaga matra gottilla	

q22opendrain	select1, string 1 0 99 1 0 99	10.19.1 OBSERVE/ASK: Is there an open drain (kaccha or pakka), nala or freeflowing drainage on the street? 10.19.1 VEEKSHISI/KELI:alli tereda charandi (kaccha or pakka), kaluve/nala aa oniyalli ideya? Yes No Could not observe houdu illa noodalu sadyavagilla	
q24drainflood	select1, string 1 0 99	*(Note: If 10.19.1 is 1)* 10.19.3 ASK: In the last month, have the open drains ever flooded? 10.19.3 KELI: hindina tingalalli tereda charandi haridu nimma maneya suttamutta bandideya? Yes No Don't Know	
q16thankyou		10.19 Thank you for your information! 10.19 namage mahiti nididdakkagi nimage vandanegalu.	
q25streetflood	select1, string 1 0 99	*(Note: If 10.19.1 is 0)* 10.19.4 OBSERVE: Is wastewater flowing freely on the road or infront of the house? 10.19.4 VEEKSHISI: kolache neeru rasthe mele athava maneya munde hariyuttideye? Yes No Could not observe	

	1 0 99	houdu illa noodalu sadyavagilla	
q23draindry	select1, string 1 0 99 1 0 99	*(Note: If 10.19.1 is 1)* 10.19.2 OBSERVE: Is there water in the drain? 10.19.2 OBSERVE: charandiyalli neeru ideya? Yes No Could not observe houdu illa noodalu sadyavagilla	
Q26Child1Weight1	input, decimal, <100	10.20.1 What is (Child's Name)'s first weight reading?	
Q27Child1Weight2	input, decimal, <100	10.20.2 What is (Child's Name)'s second weight reading?	
Q28Child2Weight1	input, decimal, <100	10.20.3 What is (Child's Name)'s first weight reading?	
Q29Child2Weight2	input, decimal, <100	10.20.4 What is (Child's Name)'s second weight reading?	
Q30Child3Weight1	input, decimal, <100	10.20.5 What is (Child's Name)'s first weight reading?	
Q31Child3Weight2	input, decimal, <100	10.20.6 What is (Child's Name)'s second weight reading?	
Section 11: Materials of the living household **upa bhaaga 11. maneyalli upayogisuva samagrigalu**			
q17roofmaterial	select1	11.1 OBSERVE WHEN LEAVING: Main material used for the roof?	□□

		11.1 BARUVA MUNNA VEEKSHISI: chavaniya nirmanakke pramukhavagi upayogisida vastu?	
	1	Kaccha (bamboo, thatch, mud)	
	2	Tin or corrugated metal	
	3	Corrugated cement sheets	
	4	Red tiles	
	5	Pakka (RCC, concrete)	
	6	Plastic tarp	
	7	Other	
	99	Can’t see the roof	
	1	kaccha (bidiru, mannu, hullu)	
	2	tagadu	
	3	cimentina tagadu	
	4	hanchu	
	5	pakka (simentu/RCC)	
	6	plastic haale	
	7	itare	
	99	noodalu sadyavagilla	
q18floormaterial	select1, string	11.2 OBSERVE WHEN LEAVING: Main material used for the floor? 11.2 BARUVA MUNNA VEEKSHISI: maneya nelakke pramukhavagi upayogisida vastu?	□
	1	Kaccha (dirt floor, wood)	
	2	Pakka (RCC, concrete)	
	3	Stone	
	4	Tiles	
	5	Other	
	1	kaccha (mannu, kattige)	
	2	pakka (simentu/RCC)	
	3	chappadi kallu	
	4	tiles	
	5	itare	

a19wallmaterial	select1, string	11.3 OBSERVE WHEN LEAVING: Main material used for the walls? 11.3 BARUVA MUNNA VEEKSHISI: maneya goode nirmanakke pramukhavagi upayogisida vastu?	□
		Kaccha (bamboo, thatch, mud, wood)	
	1	Tin or corrugated metal	
	2	Brick	
	3	Stone	
	4	Pakka (RCC, concrete)	
	5	Other	
	6		
		kaccha (bidiru, mannu, hullu, kattige)	
	1	tagadu	
	2	ittige	
	3	kallu	
	4	pakka (simentu/RCC)	
	5	itare	
	6		
q20draintype_multi_	select string	11.4 OBSERVE: What kind of drainage system services this lane? 11.4 VEEKSHISI: nimma onige yava tarahada charandi saulabhya ide?	
	piped	Piped sewers, septic tank or pit	
	open	Open drain (Skip to 10.15)	
	nala	Nala (Skip to 10.15)	
	none	No drainage system (Skip to 10.17)	
	other	Other (Skip to Section 10.17)	
	dk	Don’t know (Skip to Section 10.17)	
	piped	paipina saulabhya, septic tank athava pit	
	open	tereda charandi	
	nala	nala	
	none	yavudu charandi illa	
	other	itare	
	dk	gotilla	

q21draindry	select1, string	*(Note: If 10.13 is open)* 11.5 OBSERVE: Is there water in the drain? 11.5 VEEKSHISI: charandiyalli neeru ideya?	
	1	Yes	
	0	No	

Appendix C: Survey Instrument Used in Tanzania

User Preferences Survey

#	Questions - English	Questions - Kiswahili
1	Collect the GPS coordinates of this house, now or later?	Chukua taarifa za kijiografia (GPS) za eneo husika, sasa au badaye?
	Now	Sasa
	Later	Baadaye
2	Collect the GPS coordinates of this house.	Chukua taarifa za kijiografia (GPS) za eneo husika
3	Household No:	Namba ya nyumba:
4	District:	Wilaya:
	Kisarawe	Kisarawe
	Geita	Geita
5	Village:	Kijiji:
	Nungwe	Nungwe
	Katoma	Katoma
6	Village:	Kijiji:
	Sungwi	Sungwi
	Mitengwe	Mitengwe
7	Nungwe Hamlet:	Kitongoji Nungwe:
	Center	Center
	Kastam	Kastam
	Kisozi	Kisozi
	Zahanati	Zahanati
8	Katoma Hamlet:	Kitongoji Katoma:
	Center	Center
	Itale	Itale
	Kisoji	Kisoji
	Nyakazeze	Nyakazeze
9	Sungwi Hamlet:	Kitongoji Sungwi:
	Kimbalanganji	Kimbalanganji
	Kimbalanganji Mji Mpya	Kimbalanganji Mji Mpya
	Mbungo	Mbungo
	Mtebetini	Mtebetini
	Mtebetini Dodoma	Mtebetini Dodoma
	Sungwi Kusini	Sungwi Kusini
	Sungwi Mjini	Sungwi Mjini
10	Mitengwe Hamlet:	Kitongoji Mitengwe:

	Kinyemvulu	Kinyemvulu
	Magharibi	Magharibi
	Mashariki	Mashariki
	Mtukula	Mtukula
	Videte	Videte
	Vilabwe	Vilabwe
11	Research Assistant Name:	Jina la Mtafiti Msaidizi:
	Avelina	Avelina
	Bavon	Bavon
	Devoth	Devota
	Jastin	Jastin
	Ludano	Ludano
	Maimuna	Maimuna
	Martha	Martha
	Omary	Omary
	Silas	Silas
	Simon	Simon
	Veronica	Veronica
	Vincent	Vincent
	Supervisor	Supervisor
12	Research Assistant Name:	Jina la Mtafiti Msaidizi:
	Alfa	Alfa
	Diana	Diana
	Dorcas	Dorcas
	Frank	Frank
	Ipyana	Ipyana
	Jafari	Jafari
	Lucy	Lucy
	Mary	Mary
	Mohamed	Mohamed
	Rosemary	Rosemary
	Simon	Simon
	Valencia	Valencia
	Vestina	Vestina
	Zinduna	Zinduna
	Supervisor	Supervisor

13	Name of head of household	Jina la mkuu wa kaya

14	Which household water treatment system (HWTS) has this household been using for the last week or month?	Njia gani ya kutibu maji ilitolewa katika kaya hii katika wiki mbili au miezi iliyopita?
	Boiling	Kuchemsha
	Water Purifier	Takasa maji
	PUR	PUR
	Waterguard (liquid)	Waterguard ya maji
	Waterguard (tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Kichujamaji cha sifoni
	Ceramic pot filter	Kichujamaji cha udongo
	Boiling	Kuchemsha
	Water Purifier	Takasa maji
	PUR	PUR
	Waterguard (liquid)	Waterguard ya maji
	Waterguard (tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Kichujamaji cha sifoni
	Ceramic pot filter	Kichujamaji cha udongo
15	Name of person(s) who received training in <output value="/NIMRSWS/A28HWTS" />?	Jina la aliyepata mafunzo juu ya <output value="/NIMRSWS/A28HWTS" />?
16	Which household water treatment system (HWTS) was given to this household during the current assessment round?	Njia gani ya kutibu maji ilitolewa katika kaya hii katika duru hili ya tathmini?
17	Did you receive training in how to use <output value="/NIMRSWS/A28HWTS" />?	Umepata mafunzo yoyote kuhusiana na njia za <output value="/NIMRSWS/A28HWTS" />?
	Yes	Ndiyo
	No	Hapana
18	Can I speak to <output value="/NIMRSWS/A29HWTSTrained" />?	Ninaweza kuongea na <output value="/NIMRSWS/A29HWTSTrained" />?
	Yes	ndiyo
	No	hapana
19	When can I come back again and speak with <output value="/NIMRSWS/A29HWTSTrained" />?	Lini ninaweza kuja tena na kuongea na <output value="/NIMRSWS/A29HWTSTrained" />?

	Another day	Siku nyingine
	Later today	Baadaye
	Never	Hapana
20	What date should I return?	Siku gani ninaweza nikarudi?
21	Tell them: Thank you, sorry for any disturbance.	Waambie: Asante, samahani kwa usumbufu.

22	Which survey will you be using today?	Je utakuwa unatumia dodoso gani leo?
	Survey 1	Dodoso la kwanza
	Survey 2	Dodoso la hitimisho

23	Which Round are you in?	Je uko kwenye mzunguko upi?
	End of Round 1	Mwisho wa mzunguko wa 1
	End of Round 2	Mwisho wa mzunguko wa 2
	End of Round 3	Mwisho wa mzunguko wa 3
	End of Round 4	Mwisho wa mzunguko wa 4

24	Which Round are you in?	Je uko kwenye mzunguko upi?
	Middle of Round 1	Katikati ya mzunguko wa 1
	Middle of Round 2	Katikati ya mzunguko wa 2
	Middle of Round 3	Katikati ya mzunguko wa 3
	Middle of Round 4	Katikati ya mzunguko wa 4

25	What is your age, in years?	Una miaka mingapi?
26	Gender	Jinsia
	Female	Mke
	Male	Mume
27	How many total people normally live in your household?	Nyumba yako inawatu wa ngapi wanaoishi humu (kwa kawaida)?
28	How many are women aged 18+?	Wangapi ni wanawake wenye umri wa miaka18+?
29	How many are men aged 18+?	Wangapi ni wanaume wenye umri wa miaka 18+?
30	There is no one above 18 years old in this house.	Hakuna aliye juu ya miaka 18 katika kaya hii.

31	How many are boys aged 5-17?	Wangapi ni wavulana wenye umri wa miaka 5 – 17?
32	How many are girls aged 5-17?	Wangapi ni wasichana wenye umri wa miaka 5 – 17?
33	How many are boys under 5 years?	Wangapi ni wavulana chini ya miaka 5?
34	How many are girls under 5 years?	Wangapi ni wasichana chini ya miaka 5?
35	How many chickens or ducks do you currently own?	Je unakuku au bata wangapi, kwa sasa?
36	Did you attend a community meeting about water safety a few weeks ago?	Je ulihudhuria mkutano wa kijiji kuhusu usalama wa maji wiki chache zilizopita?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui/ sina uhakika
37	I am going to read you a list of water sources. Please tell me which sources best describe the sources that you used in the last two weeks?	Nitakusomea orodha ya vyanzo vya maji. Tafadhali niambie ni chanzo kipi ulikitumia wiki mbili zilizopita?
	Private tube well / bore well	Kisima kirefu binafsi
	Private dug well	Kisima kifupi binafsi
	Public tube well / bore well	Kisima kirefu cha jumuiya
	Public dug well	Kisima kifupi cha jumuiya
	river/stream/spring	Mto / Kijito / Chemchem
	pond/lake/dam	Dimbwi / Ziwa / Bwawa
	Stored rainwater	Maji ya mvua
	Tanker / vender	Maji ya kuuziwa
	Other/None of the above	Chanzo kingine/ Hakuna hata moja hapo juu
	Don't know	Sijui
38	What is your other source for water?	Chanzo chako kingine cha maji ni kipi?
39	The last time you collected water, what was the colour of the water from the private tube well / bore well?	Mara ya mwisho uliteka maji je rangi ya maji yalikuwaje katika kisima kirefu cha binafsi.
	Clear (no color)	Maangavu (Hayana rangi)
	Cloudy (milky)	Mawingu wingu hivi (kama maziwa)
	Brown/ muddy	Kahawia/ yenye matope
	Blackish	kama meusi
	Red/ rusty	Mekundu/yenye kutu
	Green	Kijani
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui

40	In the last two weeks, for which of the following activities did you use water from the private tube well / bore well?	Kwa wiki mbili zilizopita, maji ya kisima kirefu binafsi uliyatumia kwa shughuli zipi?
	Drinking	Kunywa
	Cooking	Kupikia
	Bathing	Kuoga
	Animals	Wanyama
	Washing /laundry	Kuoshea/kufulia
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
41	The last time you collected water, what was the colour of the water from the private dug well?	Mara ya mwisho maji uliyoteka yalikuwa na rangi gani katika kisima kifupi binafsi?
	Clear (no color)	Maangavu (Hayana rangi)
	Cloudy (milky)	Mawingu wingu hivi (kama maziwa)
	Brown/ muddy	Kahawia/ yenye matope
	Blackish	kama meusi
	Red/ rusty	Mekundu/yenye kutu
	Green	Kijani
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
42	In the last two weeks, for which of the following activities did you use water from the private dug well?	Kwa wiki mbili zilizopita, maji ya kisima kifupi binafsi uliyatumia kwa shughuli zipi?
	Drinking	Kunywa
	Cooking	Kupikia
	Bathing	Kuoga
	Animals	Wanyama
	Washing /laundry	Kuoshea/kufulia
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
43	The last time you collected water, what was the colour of the water from the public tube well / bore well?	Mara ya mwisho maji uliyoteka yalikuwa na rangi gani katika kisima kirefu cha jumuia?
	Clear (no color)	Maangavu (Hayana rangi)
	Cloudy (milky)	Mawingu wingu hivi (kama maziwa)
	Brown/ muddy	Kahawia/ yenye matope
	Blackish	kama meusi

	Red/ rusty	Mekundu/yenye kutu
	Green	Kijani
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui

44	In the last two weeks, for which of the following activities did you use water from the public tube well / bore well?	Kwa wiki mbili zilizopita, je unatumia maji ya kisima kirefu cha jumuiya kufanyia shuguli zipi?
	Drinking	Kunywa
	Cooking	Kupikia
	Bathing	Kuoga
	Animals	Wanyama
	Washing /laundry	Kuoshea/kufulia
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
45	The last time you collected water, what was the colour of the water from the public dug well?	Mara ya mwisho maji uliyoteka yalikuwa na rangi gani katika kisima kifupi cha jumuiya?
	Clear (no color)	Maangavu (Hayana rangi)
	Cloudy (milky)	Mawingu wingu hivi (kama maziwa)
	Brown/ muddy	Kahawia/ yenye matope
	Blackish	kama meusi
	Red/ rusty	Mekundu/yenye kutu
	Green	Kijani
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui

46	In the last two weeks, for which of the following activities did you use water from the public dug well?	Kwa wiki mbili zilizopita, je unatumia maji ya kisima kifupi cha jumuiya kufanyia shuguli zipi?
	Drinking	Kunywa
	Cooking	Kupikia
	Bathing	Kuoga
	Animals	Wanyama
	Washing /laundry	Kuoshea/kufulia
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui

47	The last time you collected water, what was the colour of the water from your surface water source (river / stream / spring / lake / pond / dam)?	Kwa mara ya mwisho ulipochota maji, je maji yako kutoka chanzo cha wazi (mto/ kijito/ chemchem/ dimbwi / ziwa / bwawa) yalikuwa na rangi gani?
	Clear (no color)	Maangavu (Hayana rangi)
	Cloudy (milky)	Mawingu wingu hivi (kama maziwa)
	Brown/ muddy	Kahawia/ yenye matope
	Blackish	kama meusi
	Red/ rusty	Mekundu/yenye kutu
	Green	Kijani
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
48	In the last two weeks, for which of the following activities did you use water from your surface water source (river / stream / spring / lake / pond / dam)?	Kwa wiki mbili zilizopita je unatumia maji ya chanzo cha wazi (mto/ kijito/ chemchem/ dimbwi / ziwa / bwawa) kufanyia shuguli zipi?
	Drinking	Kunywa
	Cooking	Kupikia
	Bathing	Kuoga
	Animals	Wanyama
	Washing /laundry	Kuoshea/kufulia
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
49	The last time you collected water, what was the colour of the water from your rainwater storage?	Mara ya mwisho ulipokinga maji ya mvua, je maji yako uliyohifadhi yalikuwa ni ya rangi gani?
	Clear (no color)	Maangavu (Hayana rangi)
	Cloudy (milky)	Mawingu wingu hivi (kama maziwa)
	Brown/ muddy	Kahawia/ yenye matope
	Blackish	kama meusi
	Red/ rusty	Mekundu/yenye kutu
	Green	Kijani
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
50	In the last two weeks, for which of the following activities did you use water from your rainwater storage?	Kwa wiki mbili zilizopita, je unatumia maji ya mvua ambayo uliyahifadhi kufanyia shuguli zipi?
	Drinking	Kunywa
	Cooking	Kupikia

	Bathing	Kuoga
	Animals	Wanyama
	Washing /laundry	Kuoshea/kufulia
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
51	The last time you collected water, what was the colour of the water from the tanker / vender?	Mara ya mwisho uliponunua maji, je maji yako yalikuwa ni ya rangi gani?
	Clear (no color)	Maangavu (Hayana rangi)
	Cloudy (milky)	Mawingu wingu hivi (kama maziwa)
	Brown/ muddy	Kahawia/ yenye matope
	Blackish	kama meusi
	Red/ rusty	Mekundu/yenye kutu
	Green	Kijani
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
52	In the last two weeks, for which of the following activities did you use water from the tanker / vender?	Kwa wiki mbili zilizopita je unatumia maji ya kununua (kwenye magari ya maji au wauzaji) kufanyia shuguli zipi?
	Drinking	Kunywa
	Cooking	Kupikia
	Bathing	Kuoga
	Animals	Wanyama
	Washing /laundry	Kuoshea/kufulia
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
53	The last time you collected water, what was the colour of the water from <output value= "/NIMRSWS/C12OtherSrc" />.	Mara ya mwisho ulipochota Maji kutoka <output value= "/NIMRSWS/C12OtherSrc" /> yalikuwa ni ya rangi gani?
	Clear (no color)	Maangavu (Hayana rangi)
	Cloudy (milky)	Mawingu wingu hivi (kama maziwa)
	Brown/ muddy	Kahawia/ yenye matope
	Blackish	kama meusi
	Red/ rusty	Mekundu/yenye kutu
	Green	Kijani
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui

54	In the last two weeks, for which of the following activities did you use water from <output value= "/NIMRSWS/C12OtherSrc" />?	Kwa wiki mbili zilizopita, je unatumia maji kufanyia shuguli zipi <output value= "/NIMRSWS/C12OtherSrc" />?
	Drinking	Kunywa
	Cooking	Kupikia
	Bathing	Kuoga
	Animals	Wanyama
	Washing /laundry	Kuoshea/kufulia
	Other/None of the above	Nyingine/ Hakuna jibu sahihi hapo juu
	Don't know	Sijui
55	Currently, which is your main source?	Ni chanzo kipi unakitumia zaidi, kwa sasa?
	Private tube well / bore well	Kisima kirefu binafsi
	Private dug well	Kisima kifupi binafsi
	Public tube well / bore well	Kisima kirefu cha jumuiya
	Public dug well	Kisima kifupi cha jumuiya
	river/stream/spring	Mto / Kijito / Chemchem
	pond/lake/dam	Dimbwi / Ziwa / Bwawa
	Stored rainwater	Maji ya mvua
	Tanker / vender	Maji ya kuuziwa
	Other/None of the above	Chanzo kingine/ Hakuna hata moja hapo juu
	Don't know	Sijui
56	READ TO THE RESPONDANT: I am now going to ask you several questions specifically about this source.	MSOMEE MWENYE KUJIBU: Sasa nitakuuliza maswali kadhaa kuhusu chanzo hicho cha maji
57	What is the name of this source?	Nitajie jina la chanzo hiki cha maji?
58	How many times did your household collect water from this source in the last month?	Mara ngapi watu wa nyumba yako walichota maji toka chanzo cha maji mwezi uliopita?
59	How many times did your household collect water from this source yesterday?	Mara ngapi watu wa nyumba yako walichota maji toka chanzo cha maji jana?
60	On average, how many buckets of water did you collect for each trip to this source?	Kwa wastani, ni ndoo ngapi za maji mliteka kwa kila safari toka chanzo hicho?

61	On average, how long does it take to walk to the source, wait in the cue, get water, and return?	Kwa wastani, inachukua muda gani kutembea hadi kwenye chanzo cha maji, kuchota, kusubiri na kurudi?

62	Was this time given in hours or minutes?	Je muda ulitolewa kwa masaa au dakika?
	Hours	Saa
	Minutes	Dakika
63	The time given is <output value= "/NIMRSWS/C35NmMinutes" /> hours for 1 person to make 1 trip.	Unatumia masaa <output value= "/NIMRSWS/C35NmMinutes" /> kwa mtu mmoja kwa safari moja.
64	The time given is <output value= "/NIMRSWS/C35NmMinutes" /> minutes for 1 person to make 1 trip.	Unatumia dakika <output value= "/NIMRSWS/C35NmMinutes" /> kwa mtu mmoja kwa safari moja.
65	Normally, during a single trip to your source, how many people are needed to fetch water?	Je watu wangapi wa nyumba yako kwa kawaida wanakwenda kuchota maji kwa pamoja?
66	Could you show me where your drinking water is stored?	Je unaweza kunionesha mnapohifadhi maji ya kunywa?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui/ sina uhakika

67	What did they show you?	Wamekuonyesha nini?
	Safe Storage Container from this study	Kifaa cha kutunzia maji ulichopewa
	Pot Filter Container	Kichuja maji cha udongo
	Bucket 10lts	Ndoo ya lita 10
	Bucket 20lts	Ndoo ya lita 20
	Ceramic pot	Mtungi
	Gerry can 5 - 20lt	Dumu la lita 5 - 20
	Large vesel (> 20 liters)	Chombo cha zaidi ya lita 20
	Other	Nyingine

68	What are the openings on this container?	Je chombo hiki kina midomo mingapi?

	Opening on top, narrow (no hands fit)	Mlango uko juu, mwembamba (mikono yako haingii)
	Opening on top, wide (hands fit)	Mlango uko juu, mpana (mikono yako inaingia)
	Opening on bottom, spigot	Mlango uko chini (koki)
	Other	Nyingine
69	Is this container covered?	Je chombo hiki kimefunikwa?
	Completely covered by lid or plate	Kimefunikwa kabisa kwa kifuniko au sahani
	Partially covered by lid or plate	Kimefunikwa kidogo kwa kifuniko au sahani
	Completely covered by a cloth	Kimefunikwa kabisa kwa kitambaa
	Partially covered by a cloth	Kimefunikwa kidogo kwa kitambaa
	Not covered	Hakijafunikwa
	Don't know	Sijui
70	Where is this container located?	Hiki chombo kiko wapi?
	On floor/ground	Sakafuni / Chini
	Elevated, below 1 m	Kimenyanyuliwa, chini ya mita 1
	Elevated, above 1 m	Kimenyanyuliwa, juu ya mita 1
	Don't know	Sijui
71	Do you see any of the following near the container?	Je unaona chochote katika vitu hivi karibu na chombo cha maji?
	Animals	Wanyama
	Dust/Dirt	Vumbi/ Uchafu
	Toilet	Choo
	Excrement	Kinyesi
	I do not see anything around it	Hakuna kitu chochote
	Other	Nyingine
	Don't know	Sijui
72	Did anyone treat this water in any way?	Je mtu yoyote ameyatibu maji haya kwa njia yeyote ile?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui/ sina uhakika
73	When was the last time you refilled this container?	Je kwa mara ya mwisho ulijaza maji lini kwenye chombo hiki?
	Today	Leo

	Yesterday	Jana
	The day before yesterday	Juzi
	Three days ago	Siku 3 zilizopita
	More than three days ago	Zaidi ya siku 3 zilizopita
	Don't know	Sijui
74	Could you bring me a cup of drinking water?	Je unaweza kuniletea kikombe cha maji ya kunywa?
	Yes	Ndiyo
	No	Hapana
75	How did they obtain this cup of water?	Je walipata kikombe hiki cha maji kwa njia ipi?
	Dipped cup in container	Walikitumbukiza kikombe ndani ya chombo
	Ladled from container	Walitumia upawa kuchota maji
	Poured from container	Waliyamwaga maji kutoka kwenyechombo
	Filled from tap	Walitoa maji kupitia koki
	Other	Nyingine
	Don’t know/Could not observe	Sijui/ Sikuweza kuona
76	Please specify how they obtained the water:	Tafadhali andika vile walivyopata maji.
77	What is the colour of the tap on their safe storage bucket?	Ndoo yako ya kuhifadhia maji (nyeupe) ina koki ya rangi gani?
	Red	Nyekundu
	White	Nyeupe
	Yellow	Njano
	Other	Nyingine
	Don’t know/Could not observe	Sijui/ Sikuweza kuona
78	Please tell me the difficulty of using this tap for you.	Tafadhali eleza ugumu wa matumizi ya koki hii kwako.
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don’t Know	Sijui
79	Please tell me the difficulty of using this tap for your children.	Tafadhali eleza ugumu wa matumizi ya koki hii kwa watoto wako
	Very difficult	Ngumu sana
	Difficult	Ngumu

	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Children don't use	watoto hawatumii
	Don’t Know	Sijui
80	Is the water clear?	Je maji ni maangavu (hayana rangi)?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui/ sina uhakika
81	Is your drinking water safe for you to drink right now?	Je maji ya kunywa haya ni salama kwako kwa kunywa sasa hivi?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui/ sina uhakika
82	How would you know if this water was safe to drink?	Unajuaje kama maji haya ni salama kwako kwa kunywa?
	Clear so it is clean	Ni maangavu kwa hivyo ni masafi
	Not rainy season so it is clean	Si wakati wa mvua kwa hivyo ni masafi
	No one gets sick	Hakuna anayeumwa
	Source is clean, so this water is clean	Chanzo chake ni kisafi, kwa hivyo maji haya ni masafi
	It’s not clean, but they should get used to it	Si masafi, lakini inawapasa wayazoee
	I boiled/filtered/added chlorine to it/added alum to it.	Niliyachemsha/ chuja/nili yaongezea chlorine/nili yaongeza shabu.
	Other	Nyingine
	Don’t know	Sijui
83	How would you know if this water was not safe to drink?	Unajuaje kama maji haya si salama kwako kwa kunywa?
	Not Clear so it is not clean	Si maangavu hivyo si masafi
	Rainy season so it is not clean	Ni wakati wa mvua hivyo si masafi
	Source is not clean, so this water is not clean	Chanzo chake si kisafi hivyo maji haya si masafi
	It’s not clean, but they should get used to it	Maji si masafi, ila inabidi uyazoee.
	I didn't boil/filter/add chlorine to it/add alum to it.	Sijayatibu kwa kuchemsha, kuchuja, au kuweka dawa
	The children are sick	Watoto wanaumwa
	Other	Nyingine
	Don’t know	Sijui

84	This month we gave you <output value= "/NIMRSWS/A28HWTS" />. In the last two weeks did you treat any drinking water at least once using any treatment method?	Mwezi huu tulikupatia njia ya <output value= "/NIMRSWS/A28HWTS" />. Je, kwa wiki mbili zilizopita ulitibu maji ya kunywa hata mara moja kwa kutumia njia yeyote?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
85	In the last two weeks did anyone treat any drinking water at least once using any treatment method?	Kwa wiki mbili zilizopita kuna yeyote aliyeyatibu maji ya kunywa hata mara moja kwa kutumia njia yeyote?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika

86	What are the main reasons you do not treat the water before drinking?	Ni sababu zipi kuu ambazo zinakuzuia kuyatibu maji kabla ya kuyanywa?
	Water is already clean	Maji tayari ni masafi
	Treatment does not help	Kutibu hakusaidii
	Treating water is unnecessary	Kutibu maji hakuna maana
	Too expensive	Ni ghali sana
	No time	Hakuna wakati
	Bad taste	Ladha mbaya
	Don't know how	Sijui jinsi ya kutibu
	There are no microbes	Hakuna wadudu
	Other	Nyingine
	Don't know / no response / no specific reason	Sijui/ hakuna jibu / hakuna sababu
87	Please specify what other reason was given for not treating their water:	Tafadhali taja sababu nyingine ambazo zilitolewa kwa kutochemsha maji.

88	What are the main reasons you treat the water before drinking?	Ni sababu zipi kuu ambazo zinakufanya kuyatibu maji kabla ya kuyanywa?
	Water is not clean	Maji siyo masafi
	Treatment helps	Kutibu kunasaidia
	Treating water is necessary	Kutibu maji ni muhimu
	Not too expensive	Siyo ghali sana
	Does not take too much time	Haichukui muda mrefu

	Good taste	Ladha nzuri
	I know how	Najua kutibu
	There are microbes	Kuna wadudu
	Other	Nyingine
	Don't know / no response / no specific reason	Sijui/ hakuna jibu / hakuna sababu
89	Please specify what other reason was given for treating their water:	Tafadhali taja sababu nyingine ambazo zilitolewa kwa kutibu maji.

90	What treatment or treatments was used?	Ni matibabu gani yalitumika?
	Cloth Filtration	Kuchuja kwa kitambaa
	Boiling	Kuchemsha
	Alum	Shabu
	Water Purifier	Takasa maji
	PUR	PUR
	Waterguard (liquid)	Waterguard ya maji
	Waterguard (tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Kichujamaji cha sifoni
	Ceramic pot filter	Kichujamaji cha udongo
	Sand Filter	Kichujamaji cha mchanga
	Solar Disinfection (SODIS)	Mionzi ya jua (SODIS)
	3 pot system	Mfumo wa ndoo 3 (kuvundika)
	Other	Nyingine
	Don't know	Sijui

91	In the last two weeks, what household members treated water?	Kwa wiki mbili zilizopita, ni wakazi wapi wa nyumba yako waliyatibu maji?
	Adult Women (>18 years)	Wanawake (>= miaka 18)
	Adult Men (>18 years)	Wanaume (>= miaka 18)
	Female children (<18 years)	Wasichana chini ya miaka 18
	Male children (<18 years)	Wavulana chini ya miaka 18
	Don't know	Sijui

92	In the last two weeks, who drank the treated water?	Kwa wiki mbili zilizopita, wangapi walikunywa maji yaliyotibiwa?

	Adult Women (>18 years)	Wanawake (> miaka 18)
	Adult Men (>18 years)	Wanaume (> miaka 18)
	Female children 5 - 18 years	Wasichana wa miaka 5 - 18
	Male children 5 - 18 years	Wavulana wa miaka 5 - 18
	Female children less than 5 years	Wasichana wa miaka chini ya 5
	Male children less than 5 years	Wavulana wa miaka chini ya 5
	Don't know	Sijui
93	In the last 2 weeks, how many times was cloth filtration used in this household?	Kwa wiki mbili zilizopita, ni mara ngapi maji yalichujwa kwa kitambaa katika nyumba hii?
94	In the last 2 weeks, how many times was boiling used to treat water in this household?	Kwa wiki mbili zilizopita, ni mara ngapi maji yalichemshwa katika nyumba hii?
95	In the last 2 weeks, how many times was alum used to treat water in this household?	Kwa wiki mbili zilizopita, shabu ilitumiwa mara ngapi kutibu maji katika nyumba hii?
96	In the last 2 weeks, how many times was water purifier used in this household?	Kwa wiki mbili zilizopita, takasa maji ilitumika mara ngapi katika nyumba hii?
97	In the last 2 weeks, how many times was PUR used in this household?	Kwa wiki mbili zilizopita, PUR ilitumiwa mara ngapi katika nyumba hii?
98	In the last 2 weeks, how many times was Waterguard (liquid) used in this household?	Kwa wiki mbili zilizopita, Waterguard ya maji ilitumiwa mara ngapi katika nyumba hii?
99	In the last 2 weeks, how many times were Waterguard (tablets) used in this household?	Kwa wiki mbili zilizopita, Waterguard ya vidonge ilitumiwa mara ngapi katika nyumba hii?
100	In the last 2 weeks, how many times was a ceramic siphon filter used in this household?	Kwa wiki mbili zilizopita, chujio la sifoni lilitumika, mara ngapi katika nyumba hii?
101	In the last 2 weeks, how many times did you add water to your ceramic pot filter?	Kwa wiki mbili zilizopita, ni mara ngapi mliweka maji katika chujio la udongo?
102	In the last 2 weeks, how many times was sand filter used in this household?	Kwa wiki mbili zilizopita, chujio la mchanga lilitumiwa mara ngapi katika nyumba hii?
103	In the last 2 weeks, how many times was solar disinfection (SODIS) used in this household?	Kwa wiki mbili zilizopita, mionzi ya jua (SODIS) ilitumiwa mara ngapi katika nyumba hii?
104	In the last 2 weeks, how many times was the three pot system used in this household?	Kwa wiki mbili zilizopita, njia ya ndoo tatu (kuvundika) ilitumiwa mara ngapi katika nyumba hii?

105	Could you please explain to me how to treat this water by boiling? Please give me the details of each step, and please show me any and all equipment that is used.	Tafadhali unaweza kunielezea jinsi ya kutunza/kutibu maji haya kwa kuchemsha? Tafadhali nipe maelezo ya kina ya kila hatua, na unionyeshe kifaa kimojawapo na vyote vinavyotumika.
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
106	Step 1: Filter the water through a clean cloth Did they mention this step?	Hatua ya 1: chuja maji kwa kitambaa safi Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
107	Step 1: Filter the water through a clean cloth Did they show you the equipment needed in this step?	Hatua ya 1: chuja maji kwa kitambaa safi Je, walikuonyesha kifaa kilichohitajika katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
108	Step 2: Place the pot with the water on the fire. Did they mention this step?	Hatua ya 2: Bandika chombo chenye maji jikoni. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
109	Step 2: Place the pot with the water on the fire.Did they show you the equipment needed in this step?	Hatua ya 2: Bandika chombo chenye maji jikoni.Je, walikuonyesha kifaa kilichohitajika katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
110	Step 3: Make sure the water reaches a rolling boil. Did they mention this step?	Hatua ya 3: Hakikisha maji yamechemka na kutokota. Hatua hii waliisema?

	Yes	Ndiyo
	No	Hapana
	Step 4: The water should boil for 5 minutes	Hatua ya 4: Maji yatokote kwa dakika 5 tu.
111	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 5: Take the pot off the fire and allow it to cool in a clean place.	Hatua ya 5: Ipua chombo na uruhusu maji kupoa katika mahali pasafi.
112	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 6: Pour the water into a safe storage container.	Hatua ya 6: Mimina maji kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa.
113	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 6: Pour the water into a safe storage container.	Hatua ya 6: Mimina maji kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa.
114	Did they show you the equipment needed in this step?	Je, walikuonyesha kifaa kilichohitajika katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui / sina uhakika
115	Step 6: Pour the water into a safe storage container.Did the equipment that they showed you, look like it had been used?	Hatua ya 6: Mimina maji kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa. Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui / sina uhakika

116	Did they make any additional mistakes?	Je, amafanya makosa mengine zaidi?
	Yes	Ndiyo
	No	Hapana
117	Please specify what additional mistakes:	Taja makosa mengine yaliyofanyika.
	Step 1: Filter the water through a clean cloth	Hatua ya 1: chuja maji kwa kitambaa safi
118	Please rate the difficulty of this step	Tafadhali toa maoni kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
	Step 1: Filter the water through a clean cloth	Hatua ya 1: chuja maji kwa kitambaa safi
119	Could you tell me why this step was difficult?	Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
	Step 2: Place the pot with the water on the fire.	Hatua ya 2: Bandika chombo chenye maji jikoni.
120	Please rate the difficulty of this step	Tafadhali toa maoni kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
	Step 2: Place the pot with the water on the fire.	Hatua ya 2: Bandika chombo chenye maji jikoni.
121	Could you tell me why this step was difficult?	Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
122	Step 3: Make sure the water is reaches a rolling boil.Please rate the difficulty of this step	Hatua ya 3: Hakikisha maji yamechemka na kutokota.Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana

	Difficult A little bit difficult Easy Don't Know	Ngumu Ngumu kidogo Rahisi Sijui
123	Step 3: Make sure the water is reaches a rolling boil. Could you tell me why this step was difficult?	Hatua ya 3: Hakikisha maji yamechemka na kutokota. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
124	Step 4: The water should boil for 5 minutes Please rate the difficulty of this step	Hatua ya 4: Maji yatokote kwa dakika 5 tu. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult Difficult A little bit difficult Easy Don't Know	Ngumu sana Ngumu Ngumu kidogo Rahisi Sijui
125	Step 4: The water should boil for 5 minutes Could you tell me why this step was difficult?	Hatua ya 4: Maji yatokote kwa dakika 5 tu. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
126	Step 5: Take the pot off the fire and allow it to cool in a clean place. Please rate the difficulty of this step	Hatua ya 5: Ipua chombo na uruhusu maji kupoa katika mahali pasafi. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult Difficult A little bit difficult Easy Don't Know	Ngumu sana Ngumu Ngumu kidogo Rahisi Sijui
127	Step 5: Take the pot off the fire and allow it to cool in a clean place.Could you tell me why this step was difficult?	Hatua ya 5: Ipua chombo na uruhusu maji kupoa katika mahali pasafi.Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?

	Step 6: Pour the water into a safe storage container.	Hatua ya 6: Mimina maji kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa.
128	Please rate the difficulty of this step	Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
	Step 6: Pour the water into a safe storage container.	Hatua ya 6: Mimina maji kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa.
129	Could you tell me why this step was difficult?	Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
130	Could you please show where you store the water afterwards?	Tafadhali unaweza kunionyesha mahali unapohifadhi maji baada ya hapa?
	Yes	Ndiyo
	No	Hapana
131	Observe the container.	Angalia chombo.
	Container is covered	Chombo cha kuhifadhia maji kimefunikwa
	Container is elevated from the ground	Chombo cha kuhifadhia maji kimewekwa juu ya kitu kutoka ardhini.
	Container has a narrow mouth	Chombo cha kuhifadhi maji kina mdomo mdogo/mwembamba
	Container has a tap	Chombo cha kuhifadhia maji kina bomba.
	Don't know/Do not wish to show	Sijui/sitaki kuonyesha.
132	Could you please explain to me how to treat this water by PUR? Please give me the details of each step, and please show me any and all equipment that is used.	Tafadhali unaweza kunielezea jinsi ya kutibu maji haya kwa PUR? Tafadhali nipe maelezo ya kina ya kila hatua, na unionyeshe kifaa kimojawapo na vyote vinavyotumika.
	Yes	Ndiyo
	No	Hapana

	Don't know / not sure	Sijui / sina uhakika
	Step 1: Fill a small bucket with water (10 liters).	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10).
133	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 1: Fill a small bucket with water (10 liters).	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10).
134	Did they show you the bucket needed in this step?	Je, walikuonyesha ndoo katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 1: Fill a small bucket with water (10 liters).	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10).
135	Did the equipment that they showed you look like it had been used?	Je, kifaa walichokuonyesha kinaonekana kama kimekuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 2: open your packet of PUR and pour the powder into the bucket.	Hatua ya 2: Fungua paketi ya PUR na mimina dawa kwenye ndoo.
136	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 2: open your packet of PUR and pour the powder into the bucket.	Hatua ya 2: Fungua paketi yako ya PUR na mimina dawa kwenye ndoo.
137	Did they show you the knife or scissors needed in this step?	Je, walikuonyesha kisu au mkasi katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika

	Step 2: open your packet of PUR and pour the powder into the bucket. Did the equipment that they showed you, look like it had been used?	Hatua ya 2: Fungua paketi ya PUR na mimina dawa kwenye ndoo. Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
138		
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika

	Step 3: Use a clean utensil and stir the water 5 minutes.	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5.
139	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana

	Step 3: Use a clean utensil and stir the water 5 minutes.	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5.
140	Did they show you the large spoon needed in this step?	Je, walikuonyesha mwiko katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika

	Step 3: Use a clean utensil and stir the water 5 minutes.	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5.
141	Did the equipment that they showed you look like it had been used?	Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika

	Step 4: Wait for another five minutes so that the dust can settle on the bottom.	Hatua ya 4: Subiri kwa dakika nyingine 5 maji yatulie ili uchafu uweze kujitenga.
142	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana

143	Step 5: If the water is not yet clear, stir again and leave it to settle. Did they mention this step?	Hatua ya 5: Kama maji bado hayajawa maangavu rudia tena kukoroga na uyaacha yatulie. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
144	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket.Did they mention this step?	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa.Je, walikuonyesha kitambaa safi katika hatua hii?
	Yes	Ndiyo
	No	Hapana
145	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket. Did they show you the clean cloth needed in this step?	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa. Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui / sina uhakika
146	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket. Did the equipment that they showed you look like it had been used?	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa. Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui / sina uhakika
147	Step 7: Wait for 20 minutes. Did they mention this step?	Hatua ya 7: Subiri kwa dakika 20. Hatua hii waliisema?
	Yes	Ndiyo

	No	Hapana
148	Did they make any additional mistakes?	Je, amafanya makosa mengine zaidi?
	Yes	Ndiyo
	No	Hapana
149	Please specify what additional mistakes:	Taja makosa mengine yaliyofanyika.
150	Step 1: Fill a small bucket with water (10 liters). Please rate the difficulty of this step	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10). Tafadhali toa maoni kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
151	Step 1: Fill a small bucket with water (10 liters). Could you tell me why this step was difficult?	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10). Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
152	Step 2: open your packet of PUR and pour the powder into the bucket. Please rate the difficulty of this step	Hatua ya 2: Fungua paketi ya PUR na mimina dawa kwenye ndoo. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
153	Step 2: open your packet of PUR and pour the powder into the bucket. Could you tell me why this step was difficult?	Hatua ya 2: Fungua paketi ya PUR na mimina dawa kwenye ndoo. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?

154	Step 3: Use a clean utensil and stir the water 5 minutes. Please rate the difficulty of this step	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui

155	Step 3: Use a clean utensil and stir the water 5 minutes. Could you tell me why this step was difficult?	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?

156	Step 4: Wait for another five minutes so that the dust can settle on the bottom.Please rate the difficulty of this step	Hatua ya 4: Subiri kwa dakika nyingine 5 maji yatulie ili uchafu uweze kujitenga.Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
157	Step 4: Wait for another five minutes so that the dust can settle on the bottom. Could you tell me why this step was difficult?	Hatua ya 4: Subiri kwa dakika nyingine 5 maji yatulie ili uchafu uweze kujitenga. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
158	Step 5: If the water is not yet clear, stir again and leave it to settle. Please rate the difficulty of this step	Hatua ya 5: Kama maji bado hayajawa maangavu rudia tena kukoroga na uyaacha yatulie. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu

	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
159	Step 5: If the water is not yet clear, stir again and leave it to settle. Could you tell me why this step was difficult?	Hatua ya 5: Kama maji bado hayajawa maangavu rudia tena kukoroga na uyaacha yatulie. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
160	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket. Please rate the difficulty of this step	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
161	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket.Could you tell me why this step was difficult?	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa.Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
162	Step 7: Wait for 20 minutes. Please rate the difficulty of this step.	Hatua ya 7: Subiri kwa dakika 20. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui

	Step 7: Wait for 20 minutes.	Hatua ya 7: Subiri kwa dakika 20.
163	Could you tell me why this step was difficult?	Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
164	How many packets of PUR do you have remaining?	Umebaki na pakiti ngapi za PUR?
165	Could you please show where you store the water afterwards?	Tafadhali unaweza kunionyesha mahali unapohifadhi maji baada ya hapa?
	Yes	Ndiyo
	No	Hapana

166	Observe the container.	Angalia chombo.
	Container is covered	Chombo cha kuhifadhia maji kimefunikwa
	Container is elevated from the ground	Chombo cha kuhifadhia maji kimewekwa juu ya kitu kutoka ardhini.
	Container has a narrow mouth	Chombo cha kuhifadhi maji kina mdomo mdogo/mwembamba
	Container has a tap	Chombo cha kuhifadhia maji kina bomba.
	Don't know/Do not wish to show	Sijui/sitaki kuonyesha.
167	Could you please explain to me how to treat this water by Waterguard (liquid)? Please give me the details of each step, and please show me any and all equipment that is used.	Tafadhali unaweza kunielezea jinsi ya kutunza/kutibu maji haya kwa Waterguard ya maji? Tafadhali nipe maelezo ya kina ya kila hatua, na unionyeshe kifaa kimojawapo na vyote vinavyotumika.
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 1: Filter the water through a clean cloth	Hatua ya 1: chuja maji kwa kitambaa safi
168	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana

169	Step 1: Filter the water through a clean cloth Did they show you the equipment needed in this step?	Hatua ya 1: chuja maji kwa kitambaa safi Je, walikuonyesha kifaa kilichohitajika katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
170	Step 2: Put your water in a jerry can of 20 liters. Did they mention this step?	Hatua ya 2: Weka maji kwenye dumu la lita 20. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
171	Step 2: Put your water in a jerry can of 20 liters. Did they show you the jerry can needed in this step?	Hatua ya 2: Weka maji kwenye dumu la lita 20. Je, walikuonyesha dumu katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
172	Step 2: Put your water in a jerry can of 20 liters. Did the equipment that they showed you, look like it had been used?	Hatua ya 4: Weka maji kwenye dumu la lita 20. Je, kifaa walichokuonyesha kinaonekana kama kimekuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
173	Step 3: Add 1 capful of Waterguard to the jerry can if the water is clear. Did they mention this step?	Hatua ya 3: Pima kifuniko kimoja cha waterguard a mimina kwenye dumu la maji kwa maji meupe. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana

	Step 3: Add 1 capful of Waterguard to the jerry can if the water is clear.	Hatua ya 3: Pima kifuniko kimoja cha waterguard a mimina kwenye dumu la maji kwa maji meupe.
174	Did they show you the bottle of Waterguard (liquid) needed in this step?	Je, walikuonyesha chupa ya Waterguard katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 3: Add 1 capful of Waterguard to the jerry can if the water is clear.	Hatua ya 3: Pima kifuniko kimoja cha waterguard a mimina kwenye dumu la maji kwa maji meupe.
175	Did the equipment that they showed you, look like it had been used?	Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 4: Add 2 capfuls to the jerry can if the water is cloudy.	Hatua ya 4: Mimina vifuniko viwili kwa maji yenye vumbi au tope.
176	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 5: Shake the jerry can for 1 minutes.	Hatua ya 5: Funika dumu, tikisa kwa dakika 1.
177	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 6: Wait for half an hour before drinking.	Hatua ya 6: Subiri kwa muda wa nusu saa.
178	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
179	Did they make any additional mistakes?	Je, amafanya makosa mengine zaidi?
	Yes	Ndiyo
	No	Hapana

180	Please specify what additional mistakes:	Taja makosa mengine yaliyofanyika.
181	Step 1: Filter the water through a clean clothPlease rate the difficulty of this step	Hatua ya 1: chuja maji kwa kitambaa safiTafadhali toa maoni kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
182	Step 1: Filter the water through a clean cloth Could you tell me why this step was difficult?	Hatua ya 1: chuja maji kwa kitambaa safi Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
183	Step 2: Put your water in a jerry can of 20 liters. Please rate the difficulty of this step	Hatua ya 2: Weka maji kwenye dumu la lita 20. Tafadhali toa maoni kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
184	Step 2: Put your water in a jerry can of 20 liters. Could you tell me why this step was difficult?	Hatua ya 2: Weka maji kwenye dumu la lita 20. Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
185	Step 3: Add 1 capful of Waterguard to the jerry can if the water is clear. Please rate the difficulty of this step	Hatua ya 3: Pima kifuniko kimoja cha waterguard a mimina kwenye dumu la maji kwa maji meupe. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi

	Don't Know	Sijui
186	Step 3: Add 1 capful of Waterguard to the jerry can if the water is clear.Could you tell me why this step was difficult?	Hatua ya 3: Pima kifuniko kimoja cha waterguard a mimina kwenye dumu la maji kwa maji meupe.Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
187	Step 4: Add 2 capfuls to the jerry can if the water is cloudy. Please rate the difficulty of this step	Hatua ya 4: Mimina vifuniko viwili kwa maji yenye vumbi au tope. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
188	Step 4: Add 2 capfuls to the jerry can if the water is cloudy. Could you tell me why this step was difficult?	Hatua ya 4: Mimina vifuniko viwili kwa maji yenye vumbi au tope. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
189	Step 5: Shake the jerry can for 1 minutes. Please rate the difficulty of this step	Hatua ya 5: Funika dumu, tikisa kwa dakika 1. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
190	Step 5: Shake the jerry can for 1 minutes. Could you tell me why this step was difficult?	Hatua ya 5: Funika dumu, tikisa kwa dakika 1. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?

	Step 6: Wait for half an hour before drinking.	Hatua ya 6: Subiri kwa muda wa nusu saa.
191	Please rate the difficulty of this step	Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
	Step 6: Wait for half an hour before drinking.	Hatua ya 6: Subiri kwa muda wa nusu saa.
192	Could you tell me why this step was difficult?	Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
193	How much Waterguard (Liquid) is remaining in their bottle?	Kiasi gani cha waterguard ya maji kimebaki kwenye chupa?
194	Could you please show where you store the water afterwards?	Tafadhali unaweza kunionyesha mahali unapohifadhi maji baada ya hapa?
	Yes	Ndiyo
	No	Hapana

195	Observe the container. Mark all that apply	Angalia chombo.
	Container is covered	Chombo cha kuhifadhia maji kimefunikwa
	Container is elevated from the ground	Chombo cha kuhifadhia maji kimewekwa juu ya kitu kutoka ardhini.
	Container has a narrow mouth	Chombo cha kuhifadhi maji kina mdomo mdogo/mwembamba
	Container has a tap	Chombo cha kuhifadhia maji kina bomba.
	Don't know/Do not wish to show	Sijui/sitaki kuonyesha.
196	Could you please explain to me how to treat this water by Waterguard Tablets? Please give me the details of each step, and please show me any and all equipment that is used.	Tafadhali unaweza kunielezea jinsi ya kutibu maji haya kwa Waterguard ya kidonge? Tafadhali nipe maelezo ya kina ya kila hatua, na unionyeshe kifaa kimojawapo na vyote vinavyotumika.
	Yes	Ndiyo
	No	Hapana

	Don't know / not sure	Sijui / sina uhakika
197	Step 1: Filter the water through a clean cloth Did they mention this step?	Hatua ya 1: chuja maji kwa kitambaa safi Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
198	Step 1: Filter the water through a clean cloth Did they show you the equipment needed in this step?	Hatua ya 1: chuja maji kwa kitambaa safi Je, walikuonyesha kifaa kilichohitajika katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
199	Step 2: Put your water in a jerry can of 20 liters. Did they mention this step?	Hatua ya 2: Weka maji kwenye dumu la lita 20. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
200	Step 2: Put your water in a jerry can of 20 liters. Did they show you the jerry can needed in this step?	Hatua ya 2: Weka maji kwenye dumu la lita 20. Je, walikuonyesha dumu katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
201	Step 2: Put your water in a jerry can of 20 liters. Did the equipment that they showed you, look like it had been used?	Hatua ya 2: Weka maji kwenye dumu la lita 20. Je, kifaa walichokuonyesha kinaonekana kama kimekuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika

	Step 3: Add 1 tablet to the jerry can if the water is clear.	Hatua ya 3: Weka kidonge kimoja ndani ya dumu la maji kwa maji meupe.
202	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 3: Add 1 tablet to the jerry can if the water is clear.	Hatua ya 3: Weka kidonge kimoja ndani ya dumu la maji kwa maji meupe.
203	Did they show you the Waterguard tablets needed in this step?	Je, walikuonyesha kidonge cha Waterguard katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 3: Add 1 tablet to the jerry can if the water is clear.	Hatua ya 3: Weka kidonge kimoja ndani ya dumu la maji kwa maji meupe.
204	Did the equipment that they showed you, look like it had been used?	Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 4: Add two tablets to the jerry can if the water is cloudy.	Hatua ya 4: Weka vidonge viwili kwa maji yenye vumbi au tope.
205	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 5: Shake the jerry can for 1 minutes.	Hatua ya 5: Funika dumu, tikisa kwa dakika 1.
206	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 6: Wait for half an hour before drinking.	Hatua ya 6: Subiri kwa muda wa nusu saa.
207	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana

208	Did they make any additional mistakes?	Je, amafanya makosa mengine zaidi?
	Yes	Ndiyo
	No	Hapana
209	Please specify what additional mistakes:	Taja makosa mengine yaliyofanyika.
	Step 1: Filter the water through a clean cloth	Hatua ya 1: chuja maji kwa kitambaa safi
210	Please rate the difficulty of this step	Tafadhali toa maoni kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
	Step 1: Filter the water through a clean cloth	Hatua ya 1: chuja maji kwa kitambaa safi
211	Could you tell me why this step was difficult?	Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
212	Step 2: Put your water in a jerry can of 20 liters.Please rate the difficulty of this step	Hatua ya 2: Weka maji kwenye dumu la lita 20.Tafadhali toa maoni kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
	Step 2: Put your water in a jerry can of 20 liters.	Hatua ya 2: Weka maji kwenye dumu la lita 20.
213	Could you tell me why this step was difficult?	Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
	Step 3: Add 1 tablet to the jerry can if the water is clear.	Hatua ya 3: Weka kidonge kimoja ndani ya dumu la maji kwa maji meupe.
214	Please rate the difficulty of this step	Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana

	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
215	Step 3: Add 1 tablet to the jerry can if the water is clear. Could you tell me why this step was difficult?	Hatua ya 3: Weka kidonge kimoja ndani ya dumu la maji kwa maji meupe. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
216	Step 4: Add two tablets to the jerry can if the water is cloudy. Please rate the difficulty of this step	Hatua ya 4: Weka vidonge viwili kwa maji yenye vumbi au tope. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
217	Step 4: Add two tablets to the jerry can if the water is cloudy.Could you tell me why this step was difficult?	Hatua ya 4: Weka vidonge viwili kwa maji yenye vumbi au tope.Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
218	Step 5: Shake the jerry can for 1 minutes. Please rate the difficulty of this step	Hatua ya 5: Funika dumu, tikisa kwa dakika 1. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
219	Step 5: Shake the jerry can for 1 minutes. Could you tell me why this step was difficult?	Hatua ya 5: Funika dumu, tikisa kwa dakika 1. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?

	Step 6: Wait for half an hour before drinking.	Hatua ya 6: Subiri kwa muda wa nusu saa.
220	Please rate the difficulty of this step	Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don’t Know	Sijui
	Step 6: Wait for half an hour before drinking.	Hatua ya 6: Subiri kwa muda wa nusu saa.
221	Could you tell me why this step was difficult?	Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
222	How many tablets of Waterguard do you have remaining?	Umebaki na vidonge vingapi vya Waterguard?
223	Could you please show where you store the water afterwards?	Tafadhali unaweza kunionyesha mahali unapohifadhi maji baada ya hapa?
	Yes	Ndiyo
	No	Hapana

224	Observe the container. Mark all that apply	Angalia chombo.
	Container is covered	Chombo cha kuhifadhia maji kimefunikwa
	Container is elevated from the ground	Chombo cha kuhifadhia maji kimewekwa juu ya kitu kutoka ardhini.
	Container has a narrow mouth	Chombo cha kuhifadhi maji kina mdomo mdogo/mwembamba
	Container has a tap	Chombo cha kuhifadhia maji kina bomba.
	Don’t know/Do not wish to show	Sijui/sitaki kuonyesha.
225	Could you please explain to me how to treat this water by Ceramic Siphon Filter? Please give me the details of each step, and please show me any and all equipment that is used.	Tafadhali unaweza kunielezea jinsi ya kutibu maji haya kwa Kichujamaji cha sifoni? Tafadhali nipe maelezo ya kina ya kila hatua, na unionyeshe kifaa kimojawapo na vyote vinavyotumika.
	Yes	Ndiyo
	No	Hapana

	Don't know / not sure	Sijui / sina uhakika
226	Step 1: Fill a bucket with water. Did they mention this step?	Hatua ya 1: Chota ndoo yako ya maji. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
227	Step 1: Fill a bucket with water. Did they show you the bucket needed in this step?	Hatua ya 1: Chota ndoo yako ya maji. Je, walikuonyesha ndoo katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
228	Step 1: Fill a bucket with water. Did the equipment that they showed you, look like it had been used?	Hatua ya 1: Chota ndoo yako ya maji. Je, kifaa walichokuonyesha kinaonekana kama kimekuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
229	Step 2: Put the safe storage bucket on the ground next to the table, at least one meter from the bucket. Did they mention this step?	Hatua ya 2: Weka ndoo yenye maji juu ya meza na chombo salama cha kuhifadhia maji chini, chombo cha juu kiwe angalau mita moja toka chombo cha chini. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
230	Step 2: Put the safe storage bucket on the ground next to the table, at least one meter from the bucket.Did they show you the bucket needed in this step?	Hatua ya 2: Weka ndoo yenye maji juu ya meza na chombo salama cha kuhifadhia maji chini, chombo cha juu kiwe angalau mita moja toka chombo cha chini.Je, walikuonyesha chombo salama cha kuhifadhia maji katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika

	Step 2: Put the safe storage bucket on the ground next to the table, at least one meter from the bucket. Did the equipment that they showed you, look like it had been used?	Hatua ya 2: Weka ndoo yenye maji juu ya meza na chombo salama cha kuhifadhia maji chini, chombo cha juu kiwe angalau mita moja toka chombo cha chini. Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
231		
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
232	Step 3: Put siphon filter in the water. Did they mention this step?	Hatua ya 3: Weka kichujamaji ndani ya maji. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
233	Step 3: Put siphon filter in the water. Did they show you the siphon filter needed in this step?	Hatua ya 3: Weka kichujamaji ndani ya maji. Je, walikuonyesha kichujamaji la sifoni katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
234	Step 3: Put siphon filter in the water. Did the equipment that they showed you look like it had been used?	Hatua ya 3: Weka kichujamaji ndani ya maji. Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
235	Step 4: Adjust the tap height with the O-ring.Did they mention this step?	Hatua ya 4: Rekebisha kipimo cha bomba kwa kutumia uringo.Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana

	Step 5: Squeeze the bulb, release the bulb and squeeze the bulb again.	Hatua ya 5: Kamua kitufe, achia kitufe, kamua tena kitufe.
236	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 6: Let the clean water flow into the bucket.	Hatua ya 6: Ruhusu maji safi kutiririka kwenye ndoo.
237	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 7: Wait until the bottom bucket is filled.	Hatua ya 7: Subiri mpaka ndoo yako iliyopo chini ijae.
238	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
239	Did they make any additional mistakes?	Je, amafanya makosa mengine zaidi?
	Yes	Ndiyo
	No	Hapana
240	Please specify what additional mistakes:	Taja makosa mengine yaliyofanyika.
	Step 1: Fill a bucket with water.	Hatua ya 1: Chota ndoo yako ya maji.
241	Please rate the difficulty of this step	Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don’t Know	Sijui
	Step 1: Fill a bucket with water.	Hatua ya 1: Chota ndoo yako ya maji.
242	Could you tell me why this step was difficult?	Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?

243	Step 2: Put the safe storage bucket on the ground next to the table, at least one meter from the bucket.Please rate the difficulty of this step	Hatua ya 2: Weka ndoo yenye maji juu ya meza na chombo salama cha kuhifadhia maji chini, chombo cha juu kiwe angalau mita moja toka chombo cha chini.Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
244	Step 2: Put the safe storage bucket on the ground next to the table, at least one meter from the bucket. Could you tell me why this step was difficult?	Hatua ya 2: Weka ndoo yenye maji juu ya meza na chombo salama cha kuhifadhia maji chini, chombo cha juu kiwe angalau mita moja toka chombo cha chini. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
245	Step 3: Put siphon filter in the water. Please rate the difficulty of this step	Hatua ya 3: Weka kichujamaji ndani ya maji. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
246	Step 3: Put siphon filter in the water. Could you tell me why this step was difficult?	Hatua ya 3: Weka kichujamaji ndani ya maji. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
247	Step 4: Adjust the tap height with the O-ring. Please rate the difficulty of this step	Hatua ya 4: Rekebisha kipimo cha bomba kwa kutumia uringo. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana

	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
248	Step 4: Adjust the tap height with the O-ring.Could you tell me why this step was difficult?	Hatua ya 4: Rekebisha kipimo cha bomba kwa kutumia uringo.Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
249	Step 5: Squeeze the bulb, release the bulb and squeeze the bulb again. Please rate the difficulty of this step	Hatua ya 5: Kamua kitufe, achia kitufe, kamua tena kitufe. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
250	Step 5: Squeeze the bulb, release the bulb and squeeze the bulb again. Could you tell me why this step was difficult?	Hatua ya 5: Kamua kitufe, achia kitufe, kamua tena kitufe. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
251	Step 6: let the clean water flow into the bucket. Please rate the difficulty of this step	Hatua ya 6: Ruhusu maji safi kutiririka kwenye ndoo. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
252	Step 6: let the clean water flow into the bucket. Could you tell me why this step was difficult?	Hatua ya 6: Ruhusu maji safi kutiririka kwenye ndoo. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?

	Step 7: Wait until the bottom bucket is filled with water.	Hatua ya 7: Subiri mpaka ndoo yako iliyopo chini ijae.
253	Please rate the difficulty of this step	Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui

	Step 7: Wait until the bottom bucket is filled with water.	Hatua ya 7: Subiri mpaka ndoo yako iliyopo chini ijae.
254	Could you tell me why this step was difficult?	Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
255	Could you please show where you store the water afterwards?	Tafadhali unaweza kunionyesha mahali unapohifadhi maji baada ya hapa?
	Yes	Ndiyo
	No	Hapana

256	Observe the container. Mark all that apply	Angalia chombo.
	Container is covered	Chombo cha kuhifadhia maji kimefunikwa
	Container is elevated from the ground	Chombo cha kuhifadhia maji kimewekwa juu ya kitu kutoka ardhini.
	Container has a narrow mouth	Chombo cha kuhifadhi maji kina mdomo mdogo/mwembamba
	Container has a tap	Chombo cha kuhifadhia maji kina bomba.
	Don't know/Do not wish to show	Sijui/sitaki kuonyesha.

257	Please read the following note to the household: You will keep the safe storage container and the improved cook stove as gifts, but this pot filter is only for you to use for 1 month. After 1 month you will be given the opportunity to buy this filter, either for chickens or cash. If you do not pay for this filter, you will be required to return it.	Tafadhali soma yote kwa mwenye kaya. Utahifadhi kifaa cha kutunzia maji na jiko imara kama zawadi,lakini kichuja maji hiki utakitumia kwa mwezi mmoja.Baada ya mwezi mmoja utapa muda wa kununua kichuja maji hiki,kwa kuku au kwa hela.kama hutonunua kichuja maji hiki,utakirudisha kichuja maji.
258	Could you please explain to me how to treat this water by Ceramic Pot Filter? Please give me the details of each step, and please show me any and all equipment that is used.	Tafadhali unaweza kunielezea jinsi ya kutibu maji haya kwa Kichujamaji cha udongo? Tafadhali nipe maelezo ya kina ya kila hatua, na unionyeshe kifaa kimojawapo na vyote vinavyotumika.
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui / sina uhakika
259	Step 1: Put the filter inside the bucket or in a special container.Did they mention this step?	Hatua ya 1: Weka kichujamaji ndani ya ndoo au chombo maalumu.Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
260	Step 1: Put the filter inside the bucket or in a special container. Did they show you the bucket and pot filter needed in this step?	Hatua ya 1: Weka kichujamaji ndani ya ndoo au chombo maalumu. Je, walikuonyesha ndoo na Kichujamaji cha udongo katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui / sina uhakika
261	Step 1: Put the filter inside the bucket or in a special container. Did the equipment that they showed you, look like it had been used?	Hatua ya 1: Weka kichujamaji ndani ya ndoo au chombo maalumu. Je, kifaa walichokuonyesha kinaonekana kama kimekuwa kikitumika?
	Yes	Ndiyo
	No	Hapana

	Don't know / not sure	Sijui / sina uhakika
	Step 2: Pour water inside the filter.	Hatua ya 2: Mimina maji kwenye kichujamaji.
262	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 3: Cover the filter and wait for the water to filter.	Hatua ya 3: Funika kichujamaji kisha subiri maji yachujwe.
263	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 3: Cover the filter and wait for the water to filter.	Hatua ya 3: Funika kichujamaji kisha subiri maji yachujwe.
264	Did they show you the cover needed in this step?	Je, walikuonyesha mfuniko katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
265	Step 3: Cover the filter and wait for the water to filter.Did the equipment that they showed you, look like it had been used?	Hatua ya 3: Funika kichujamaji kisha subiri maji yachujwe.Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
266	Did they make any additional mistakes?	Je, amafanya makosa mengine zaidi?
	Yes	Ndiyo
	No	Hapana
267	Please specify what additional mistakes:	Taja makosa mengine yaliyofanyika.
	Step 1: Put the filter inside the bucket or in a special container.	Hatua ya 1: Weka kichujamaji ndani ya ndoo au chombo maalumu.
268	Please rate the difficulty of this step	Tafadhali toa maoni kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana

	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
269	Step 1: Put the filter inside the bucket or in a special container. Could you tell me why this step was difficult?	Hatua ya 1: Weka kichujamaji ndani ya ndoo au chombo maalumu. Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
270	Step 2: Pour water inside the filter. Please rate the difficulty of this step	Hatua ya 2: Mimina maji kwenye kichujamaji. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
271	Step 2: Pour water inside the filter. Could you tell me why this step was difficult?	Hatua ya 2: Mimina maji kwenye kichujamaji. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
272	Step 3: Cover the filter and wait for the water to filter.Please rate the difficulty of this step	Hatua ya 3: Funika kichujamaji kisha subiri maji yachujwe.Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
273	Step 3: Cover the filter and wait for the water to filter. Could you tell me why this step was difficult?	Hatua ya 3: Funika kichujamaji kisha subiri maji yachujwe. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?

274	What regular maintenance should you do for the Ceramic Pot Filter?	Je ni vitu gani vya kufanya katika kukitunza kichujamaji cha udongo?
	Wash the filter	Safisha kichujamaji
	Dip the filter in boiling water	Chemsha kichujamaji kwa maji yamoto
	Other	Nyingine
	Don’t know / not sure	Sijui / sina uhakika

275	How often should you wash the filter?	Je unatakiwa kusafisha kichujamaji mara ngapi?
	1 time or more per week	Mara 1 au zaidi kwa wiki
	1 time every 8 - 14 days	Mara 2 au zaidi kati ya siku 8 - 14
	1 time every 15 days or more	Mara 1 kila baada ya siku 15 au zaidi
	Other	Nyingine
	Don’t know / not sure	Sijui / sina uhakika

276	You should wash your filter with what?	Je unapaswa kuosha kichujamaji kwa kutumia nini?
	Water	Maji
	Brush	Brashi
	Soap	Sabuni
	Ash	Majivu
	Other	Engine
	Don’t know / not sure	Sijui / sina uhakika

277	How long should you use the filter before boiling it again?	Unatakiwa kutumia kichujamaji kwa muda gani kabla ya kukichemsha?
	Less than 3 months	Chini ya miezi mitatu
	3 months	Miezi 3
	More than 3 months	Zaidi ya miezi 3
	Other	Engine
	Don’t know / not sure	Sijui / sina uhakika
278	Since you received your Ceramic Pot Filter, have you boiled it?	Tangu upewe hiki kichuja maji, umewahi kukisafisha kwa kuchemsa?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui / sina uhakika

279	When boiling filter: Step 1: Remove the ceramic filter from the bucket. Please rate the difficulty of this step	Hatua ya 1: Toa kichuja maji kutoka kwenye ndoo yake. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
280	When boiling filter: Step 1: Remove the ceramic filter from the bucket. Could you tell me why this step was difficult?	Hatua ya 1: Toa kichuja maji kutoka kwenye ndoo yake. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
281	When boiling filter: Step 2: Put your ceramic filter in boiling water. Please rate the difficulty of this step	Hatua ya 2:Weka kichuja maji chako kwenye maji yaliyochemka. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
282	When boiling filter: Step 2: Put your ceramic filter in boiling water. Could you tell me why this step was difficult?	Hatua ya 2: Weka kichuja maji chako kwenye maji yanachemka. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
283	When boiling filter: Step 3: Remove your ceramic filter from the hot water and put it in your bucket.Please rate the difficulty of this step	Hatua ya 3: Ondoa kichuja maji chako toka jikoni na kirejeshe kwenye ndoo yake.Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi

	Don't Know	Sijui
284	When boiling filter: Step 3: Remove your ceramic filter from the hot water and put it in your bucket. Could you tell me why this step was difficult?	Wakati wa kuchemsha kichujamaji: Hatua ya 3: Ondoa kichuja maji chako toka jikoni na kirejeshe kwenye ndoo yake. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
285	Could you please explain to me how to treat this water by Treatment Powder? Please give me the details of each step, and please show me any and all equipment that is used.	Tafadhali unaweza kunielezea jinsi ya kutibu maji haya kwa Takasa Maji? Tafadhali nipe maelezo ya kina ya kila hatua, na unionyeshe kifaa kimojawapo na vyote vinavyotumika.
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
286	Step 1: Fill a small bucket with water (10 liters). Did they mention this step?	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10). Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
287	Step 1: Fill a small bucket with water (10 liters). Did they show you the bucket needed in this step?	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10). Je, walikuonyesha ndoo katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
288	Step 1: Fill a small bucket with water (10 liters).Did the equipment that they showed you look like it had been used?	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10).Je, kifaa walichokuonyesha kinaonekana kama kimekuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika

	Step 2: Open your packet of Water Treatment and pour the powder into the bucket.	Hatua ya 2: Fungua paketi ya Takasa Maji na mimina dawa kwenye ndoo.
289	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
	Step 2: open your packet of Water Treatment and pour the powder into the bucket.	Hatua ya 2: Fungua paketi yako ya Takasa Maji na mimina dawa kwenye ndoo.
290	Did they show you the knife or scissors needed in this step?	Je, walikuonyesha kisu au mkasi katika hatua hii?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 2: open your packet of Water Treatment and pour the powder into the bucket.	Hatua ya 2: Fungua paketi ya Takasa Maji na mimina dawa kwenye ndoo.
291	Did the equipment that they showed you, look like it had been used?	Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 3: Use a clean utensil and stir the water 5 minutes.	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5.
292	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
293	Step 3: Use a clean utensil and stir the water 5 minutes.Did they show you the large spoon needed in this step?	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5.Je, walikuonyesha mwiko katika hatua hii?
	Yes	Ndiyo
	No	Hapana

	Don’t know / not sure	Sijui / sina uhakika
294	Step 3: Use a clean utensil and stir the water 5 minutes. Did the equipment that they showed you look like it had been used?	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5. Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don’t know / not sure	Sijui / sina uhakika
295	Step 4: Wait for another five minutes so that the dust can settle on the bottom. Did they mention this step?	Hatua ya 4: Subiri kwa dakika nyingine 5 maji yatulie ili uchafu uweze kujitenga. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
296	Step 5: If the water is not yet clear, stir again and leave it to settle. Did they mention this step?	Hatua ya 5: Kama maji bado hayajawa maangavu rudia tena kukoroga na uyaacha yatulie. Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
297	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket. Did they mention this step?	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa. Je, walikuonyesha kitambaa safi katika hatua hii?
	Yes	Ndiyo
	No	Hapana
298	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket.Did they show you the clean cloth needed in this step?	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa.Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo

	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket.	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa.
299	Did the equipment that they showed you look like it had been used?	Je, kifaa walichokuonyesha, kinaonekana kama kilikuwa kikitumika?
	Yes	Ndiyo
	No	Hapana
	Don't know / not sure	Sijui / sina uhakika
	Step 7: Wait for 20 minutes.	Hatua ya 7: Subiri kwa dakika 20.
300	Did they mention this step?	Hatua hii waliisema?
	Yes	Ndiyo
	No	Hapana
301	Did they make any additional mistakes?	Je, amafanya makosa mengine zaidi?
	Yes	Ndiyo
	No	Hapana
302	Please specify what additional mistakes:	Taja makosa mengine yaliyofanyika.
	Step 1: Fill a small bucket with water (10 liters).	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10).
303	Please rate the difficulty of this step	Tafadhali toa maoni kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
304	Step 1: Fill a small bucket with water (10 liters).Could you tell me why this step was difficult?	Hatua ya 1: Weka maji kwenye ndoo ndogo (lita 10).Je, unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?

	Step 2: Open your packet of Water Treatment and pour the powder into the bucket.	Hatua ya 2: Fungua paketi ya Takasa Maji na mimina dawa kwenye ndoo.
305	Please rate the difficulty of this step	Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
	Step 2: Open your packet of Water Treatment and pour the powder into the bucket.	Hatua ya 2: Fungua paketi ya Takasa Maji na mimina dawa kwenye ndoo.
306	Could you tell me why this step was difficult?	Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
	Step 3: Use a clean utensil and stir the water 5 minutes.	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5.
307	Please rate the difficulty of this step	Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
	Step 3: Use a clean utensil and stir the water 5 minutes.	Hatua ya 3: Koroga mchanganyiko kwa kutumia kifaa safi kwa muda wa dakika 5.
308	Could you tell me why this step was difficult?	Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
	Step 4: Wait for another five minutes so that the dust can settle on the bottom.	Hatua ya 4: Subiri kwa dakika nyingine 5 maji yatulie ili uchafu uweze kujitenga.
309	Please rate the difficulty of this step	Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu

	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
310	Step 4: Wait for another five minutes so that the dust can settle on the bottom. Could you tell me why this step was difficult?	Hatua ya 4: Subiri kwa dakika nyingine 5 maji yatulie ili uchafu uweze kujitenga. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
311	Step 5: If the water is not yet clear, stir again and leave it to settle. Please rate the difficulty of this step	Hatua ya 5: Kama maji bado hayajawa maangavu rudia tena kukoroga na uyaacha yatulie. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui
312	Step 5: If the water is not yet clear, stir again and leave it to settle. Could you tell me why this step was difficult?	Hatua ya 5: Kama maji bado hayajawa maangavu rudia tena kukoroga na uyaacha yatulie. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
313	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket. Please rate the difficulty of this step	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don't Know	Sijui

314	Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket.Could you tell me why this step was difficult?	Hatua ya 6: Chuja maji kwa kutumia kitambaa safi cha pamba kwenye chombo maalumu cha kuhifadhia maji yaliyotibiwa.Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
315	Step 7: Wait for 20 minutes. Please rate the difficulty of this step.	Hatua ya 7: Subiri kwa dakika 20. Tafadhali toa maoni yako kuhusu ugumu wa hatua hii
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don’t Know	Sijui
316	Step 7: Wait for 20 minutes. Could you tell me why this step was difficult?	Hatua ya 7: Subiri kwa dakika 20. Unaweza kuniambia kwa nini hatua hii ilikuwa ngumu?
317	How many packets of Water Treatment do you have remaining?	Umebaki na pakiti ngapi za Takasa Maji?
318	Could you please show where you store the water afterwards?	Tafadhali unaweza kunionyesha mahali unapohifadhi maji baada ya hapa?
	Yes	Ndiyo
	No	Hapana
319	Observe the container.	Angalia chombo.
	Container is covered	Chombo cha kuhifadhia maji kimefunikwa
	Container is elevated from the ground	Chombo cha kuhifadhia maji kimewekwa juu ya kitu kutoka ardhini.
	Container has a narrow mouth	Chombo cha kuhifadhi maji kina mdomo mdogo/mwembamba
	Container has a tap	Chombo cha kuhifadhia maji kina bomba.
	Don’t know/Do not wish to show	Sijui/sitaki kuonyesha.

285	NOTE: I am going to give you cards with pictures of all of the treatment methods used in your village. (NOTE: explain each card to the household) I would like you to take a moment and think about each treatment method, what you liked about it, and what you didn't like about it.	KUMBUKA: Nitakupa kadi zenye picha za mbinu zote za kutibu maji ambazo zimetumika kijijini kwako hadi sasa (ILANI: elezea kadi kwa mwenyekaya). Ningependa upate muda na kufikiri kila mbinu ya kutibu maji, kitu gani ulikipenda au hukukipenda kuhusu mbinu husika.
286	Which HWTS technologies would you recommend to a good friend or relative?	Je, ni njia gani ya kutibu maji ungependa kumshauri rafiki yako au ndugu yako kutumia?
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha
	Alum + Powdered Chlorine	Shabu + Unga wa Klorini
	PUR	PUR
	Waterguard (Liquid)	Waterguard ya maji
	Waterguard (Tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Chujio la sifoni
	Ceramic pot filter	Chujio la udongo
	None of them	Hakuna hata moja hapo juu
	I don't know	Sijui
287	NOTE: I would like you to arrange the cards into 3 groups; those treatments which you liked, those you did not like and those which you are indifferent to.	KUMBUKA: Halafu, upange kadi katika mafungu matatu; zile mbinu ulizozipenda na zile ambazo hukuzipenda na zile ambazo huzipendi au unazipenda.
288	How many HWTS did the respondant like?	Ni aina ngapi za tiba ambazo mhojiwa alizipenda?
289	How many HWTS did the respondant not like?	Ni aina ngapi za tiba ambazo mhojiwa hakuzipenda?
290	NOTE: In the group of HWTS which you liked, I would like you to arrange the cards according to which treatments you most prefer, with your top preference on the left, your next highest preference to the right of your top preference and so on.	KUMBUKA: Katika kundi la HWTS ipi umeipenda,ningependa uzipange kutoka na ulizozipena zaidi, upande wa kushoto,na ulizozipenda kidogo upande wa kuria na kuendelea.
291	What is their favorite HWTS?	Ni njia ipi ya matibabu ambayo ni chaguo lako?
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha

	Alum + Powdered Chlorine	Shabu + Unga wa Klorini
	PUR	PUR
	Waterguard (Liquid)	Waterguard ya maji
	Waterguard (Tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Chujio la sifoni
	Ceramic pot filter	Chujio la udongo
	I don't know	Sijui

292	Compared to the other HWTS, what do you like about your favorite HWTS?	Ukilinganisha na njia za matibabu nyingine, ni kitu gani unakipenda katika matibabu uliyochagua?
	Easy to use	Rahisi kutumia
	Water tastes good	Maji yana ladha nzuri
	Effective	Inafaa
	Nice design	Muundo mzuri
	Doesn’t require much tiime	Haihitaji muda mrefu
	Other	Nyinginezo
293	Other reason for liking this HWTS:	sababu nyingine inayoendana na HWTS
294	What is their 2nd favorite HWTS?	Ni njia ipi ya matibabu ambayo ni chaguo lako la pili?
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha
	Alum + Powdered Chlorine	Shabu + Unga wa Klorini
	PUR	PUR
	Waterguard (Liquid)	Waterguard ya maji
	Waterguard (Tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Chujio la sifoni
	Ceramic pot filter	Chujio la udongo
	I don't know	Sijui

295	Compared to the other HWTS, what do you like about your 2nd favorite HWTS?	Ukilinganisha na njia za matibabu nyingine, ni kitu gani unakipenda katika njia hii ya pili ya matibabu uliyochagua?
	Easy to use	Rahisi kutumia
	Water tastes good	Maji yana ladha nzuri
	Effective	Inafaa
	Nice design	Muundo mzuri
	Doesn’t require much tiime	Haihitaji muda mrefu
	Other	Nyinginezo
296	Other reason for liking this HWTS:	sababu nyingine inayoendana na HWTS

297	What is their 3rd favorite HWTS?	Ni njia gani ya matibabu ambayo ni chaguo lako la tatu?
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha
	Alum + Powdered Chlorine	Shabu + Unga wa Klorini
	PUR	PUR
	Waterguard (Liquid)	Waterguard ya maji
	Waterguard (Tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Chujio la sifoni
	Ceramic pot filter	Chujio la udongo
	I don't know	Sijui
298	Compared to the other HWTS, what do you like about your 3rd favorite HWTS?	Ukilinganisha na njia za matibabu nyingine, ni kitu gani unakipenda katika njia hii ya tatu ya matibabu uliyochagua?
	Easy to use	Rahisi kutumia
	Water tastes good	Maji yana ladha nzuri
	Effective	Inafaa
	Nice design	Muundo mzuri
	Doesn’t require much tiime	Haihitaji muda mrefu
	Other	Nyinginezo
299	Other reason for liking this HWTS:	sababu nyingine inayoendana na HWTS
300	What is their 4th favorite HWTS?	Ni njia gani ya matibabu ambayo ni chaguo lako la nne?
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha
	Alum + Powdered Chlorine	Shabu + Unga wa Klorini
	PUR	PUR
	Waterguard (Liquid)	Waterguard ya maji
	Waterguard (Tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Chujio la sifoni
	Ceramic pot filter	Chujio la udongo
	I don't know	Sijui
301	Compared to the other HWTS, what do you like about your 4th favorite HWTS?	Ukilinganisha na njia za matibabu nyingine, ni kitu gani unakipenda katika njia hii ya nne ya matibabu uliyochagua?
	Easy to use	Rahisi kutumia
	Water tastes good	Maji yana ladha nzuri
	Effective	Inafaa
	Nice design	Muundo mzuri
	Doesn’t require much tiime	Haihitaji muda mrefu

	Other	Nyinginezo
302	Other reason for liking this HWTS:	sababu nyingine inayoendana na HWTS
303	NOTE: In the group of HWTS which you did not like, please arrange the cards according to which treatments you disliked the most, with your most disliked on the left, the next most disliked to the right of the most disliked and so on.	KUMBUKA: Katika fungu la kadi za matibabu ambazo hukuzipenda, tafadhali zipange kulingana na mbinu ambayo hukuipenda zaidi, kwa kuiweka upande wa kushoto, zinazofuatia upande wa kulia mwa zile za awali na kuendelea.
304	What is their most disliked HWTS?	Ni njia gani ya matibabu ambayo hawakuipenda kabisa?
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha
	Alum + Powdered Chlorine	Shabu + Unga wa Klorini
	PUR	PUR
	Waterguard (Liquid)	Waterguard ya maji
	Waterguard (Tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Chujio la sifoni
	Ceramic pot filter	Chujio la udongo
	I don't know	Sijui
305	Compared to the other HWTS, what do you dislike about your most disliked HWTS?	Ukilinganisha na njia za matibabu nyingine, ni kitu gani usichokipenda katika njia hii ya matibabu usiyo ipenda kabisa?
	Difficult to use	Ngumu kutumia
	Water tastes bad	Maji yana ladha mbaya
	Not effective	Haifai
	Bad design	Muundo mbaya
	Requires too much tiime	Inahitaji muda mrefu
	Other	Nyinginezo
306	Other reason for disliking this HWTS:	Sababu nyingine za kutopenda HWTS:
307	What is their 2nd most disliked HWTS?	Ni njia gani ya pili ya matibabu ambayo hawakuipenda?
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha
	Alum + Powdered Chlorine	Shabu + Unga wa Klorini
	PUR	PUR
	Waterguard (Liquid)	Waterguard ya maji
	Waterguard (Tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Chujio la sifoni
	Ceramic pot filter	Chujio la udongo
	I don't know	Sijui

308	Compared to the other HWTS, what do you dislike about your 2nd most disliked HWTS?	Ukilinganisha na njia za matibabu nyingine, ni kitu gani usichokipenda katika njia hii ya pili matibabu?
	Difficult to use	Ngumu kutumia
	Water tastes bad	Maji yana ladha mbaya
	Not effective	Haifai
	Bad design	Muundo mbaya
	Requires too much tiime	Inahitaji muda mrefu
	Other	Nyinginezo
309	Other reason for disliking this HWTS:	Sababu nyingine za kutoipenda mbinu hii ya matibabu:
310	What is their 3rd most disliked HWTS?	Ni njia gani ya tatu ya matibabu ambayo hawakuipenda?
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha
	Alum + Powdered Chlorine	Shabu + Unga wa Klorini
	PUR	PUR
	Waterguard (Liquid)	Waterguard ya maji
	Waterguard (Tablets)	Waterguard ya kidonge
	Ceramic siphon filter	Chujio la sifoni
	Ceramic pot filter	Chujio la udongo
	I don't know	Sijui

311	Compared to the other HWTS, what do you dislike about your 3rd most disliked HWTS?	Ukilinganisha na njia za matibabu nyingine, ni kitu gani usichokipenda katika njia hii ya tatu matibabu?
	Difficult to use	Ngumu kutumia
	Water tastes bad	Maji yana ladha mbaya
	Not effective	Haifai
	Bad design	Muundo mbaya
	Requires too much tiime	Inahitaji muda mrefu
	Other	Nyinginezo
312	Other reason for disliking this HWTS:	Sababu nyingine za kutopenda HWTS:
313	What is their 4th most disliked HWTS?	Ni njia gani ya nne ya matibabu ambayo hawakuipenda?
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha
	Alum + Powdered Chlorine	Shabu + Unga wa Klorini
	PUR	PUR
	Waterguard (Liquid)	Waterguard ya maji
	Waterguard (Tablets)	Waterguard ya kidonge

	Ceramic siphon filter	Chujio la sifoni
	Ceramic pot filter	Chujio la udongo
	I don't know	Sijui
314	Compared to the other HWTS, what do you dislike about your 4th most disliked HWTS?	Ukilinganisha na njia za matibabu nyingine, ni kitu gani usichokipenda katika njia hii ya nne matibabu?
	Difficult to use	Ngumu kutumia
	Water tastes bad	Maji yana ladha mbaya
	Not effective	Haifai
	Bad design	Muundo mbaya
	Requires too much tiime	Inahitaji muda mrefu
	Other	Nyinginezo
315	Other reason for disliking this HWTS:	Sababu nyingine za kutopenda HWTS:
316	In the last week, how many times was <output value="/NIMRSWS/A28HWTS" /> used in this household?	Katika wiki iliyopita, <output value="/NIMRSWS/A28HWTS" /> ilitumiwa mara ngapi katika nyumba hii?
317	In the last week, how many times did you add water to your ceramic pot filter?	Katika wiki iliyopita, ni mara ngapi mliweka maji katika chujio la udongo?
318	Please rate the ease of use of <output value="/NIMRSWS/A28HWTS" />.	Tafadhali toa maoni yako kuhusu urahisi wa matumizi ya <output value="/NIMRSWS/A28HWTS" />.
	Very difficult	Ngumu sana
	Difficult	Ngumu
	A little bit difficult	Ngumu kidogo
	Easy	Rahisi
	Don’t Know	Sijui
319	Please rate the taste of water after using <output value="/NIMRSWS/A28HWTS" />.	Tafadhali toa maoni yako kuhusu ladha ya maji baada ya kutumia njia ya <output value="/NIMRSWS/A28HWTS" />.
	Very bad	Mbaya sana
	Bad	Mbaya
	Good	Nzuri
	very good	Nzuri sana
	Don’t Know	Sijui
320	Please rate the effectiveness of <output value="/NIMRSWS/A28HWTS" /> in terms of improving safety of treated water.	Nini maoni yako juu ya njia ya <output value="/NIMRSWS/A28HWTS" /> kwa jinsi inavyoyafanya maji kuwa salama?
	Doesn't kill germs at all	Haiui vijidudu kabisa

	Doesn't kill germs adequately	Haiui vijidudu vya kutosha
	It somewhat kills germs	Inaua vijidudu kiasi
	It kills all germs	Inaua vijidudu vyote
	Don’t Know	Sijui
321	Please rate how appealing it is to use <output value="/NIMRSWS/A28HWTS" />.	Tafadhali toa maoni kuhusu jinsi inavyovutia kutumia njia ya <output value="/NIMRSWS/A28HWTS" />.
	Unappealing	Haivutii
	Not appealing	Haina mvuto
	appealing	Inavutia
	Very appealing	Inavutia sana
	Don’t Know	Sijui
322	How long does it take to use <output value="/NIMRSWS/A28HWTS" />. <output value="if(/NIMRSWS/A28HWTS = 'Kuchemsha', 'Note: Include time for collecting fuel and cooling', ' ')" />	Inakuchukua muda gani kutibu maji ya kunywa kwa njia ya <output value="/NIMRSWS/A28HWTS" />. <output value="if(/NIMRSWS/A28HWTS = 'Kuchemsha', 'Kumbuka: Ongeza muda wa kutafuta kuni na kuchemsha.', ' ')" />
	Less than 5 min	Chini ya dakika 5
	6-14 min	Dakika 6 – 14
	15-30 min	Dakika 15 – 30
	More than 30 min	Zaidi ya dakika 30
	Don’t Know	Sijui
323	Please rate the amount of time it takes to use <output value="/NIMRSWS/A28HWTS" />.	Tafadhali toa maoni kuhusu kiasi cha muda unaohitajika kutibu maji kwa njia ya <output value="/NIMRSWS/A28HWTS" />.
	Too much time	Muda mrefu sana
	A lot of time	Muda mrefu
	Some time	Muda kiasi
	Very little time	Muda kidogo sana
	Don’t Know	Sijui
376	You have reached the end of the survey. Remember to thank the respondant!	Umefika mwisho wa maswali. Kumbuka kumshukuru mtu uliyemhoji!
377	Collect the GPS coordinates of this house.	Chukua taarifa za kijiografia (GPS) za eneo husika

WTP Survey

#	English	Kiswahili
1	**You are receiving your improved cook stove and the improved water storage container as compensation for your participation in this study. But we would like to also offer you all of the treatment options that you have tested over the last few months.**	**Unapokea jiko bora na chombo bora cha kuhifadhia maji kama zawadi kutokana na kushiriki kwako katika utafiti huu. Lakini tungependa pia kukupa vifaa mbalimbali ambavyo umevijaribu katika kusafisha maji katika miezi michache iliyopita.**
2	**Unfortunately, we cannot offer them for free. Instead we would like to play a game with you, called the "Buying Game". During this game you will have the option to buy these treatments. You are not required to buy/trade for anything, but you will also not be given any of these items for free.**	**Hata hivyo, hatuwezi kukupatia bure. Badala yake tutapenda kucheza nawe, mchezo unaoitwa "Mchezo wa Manunuzi." Wakati wa mchezo huu utakuwa na fursa ya kununua vifaa hivi. Si lazima ununue au kubadilishana na kitu chochote, lakini pia hautapewa mojawapo ya bidhaa hizi bure. Hatuwezi kukupatia bure, badala yake tungependa ushiriki mchezo utakaokuwezesha kununua.**
3	**Do you have any questions?**	**Je, una swali lolote?/ Je, una maswali?**
	Yes	Ndiyo
	No	Hapana
4	**(Don't read this screen out loud)**	**(Usisome kwa sauti)**
	NOTE: Please answer any questions that they have, and review the rules of the game if necessary.	*KUMBUKA:Tafadhari jibu maswali yote waliyokuuliza and hakikisha unafuata sheria zote za mcchezo*
5	**Would you like to participate in our Buying Game?**	**Je, ungependa kushiriki katika Mchezo wetu wa Manunuzi?**
	Yes	Ndiyo
	No	Hapana
6	**Could you tell me why you are choosing to not participate?**	**Hunaweza kuniambia kwanini hutaki kushiriki?**
	I have cash/mobile money/chickens but I want to keep it.	Nina hela/simu kwa hela/kuku, lakini nataka kutunza.
	I don't wish to purchase any HWTS	Sitaki ununua kifaa chochote cha HWTS
	I don't have cash, mobile credit nor chickens.	Sina pesa taslimu, mkopo unaohamishika wala kuku.
	Other	nyingine
	I don't know	sijui
7	**Before we start the game, I would like to ask you a few questions.**	**Kabla hatujaanza mchezo, nitapenda kukuuliza maswali machache.**
8	**Have you ever been to a store and made a purchase?**	**Je, umewahi kununua bidhaa dukani/sokoni?**
	Yes	Ndiyo
	No	Hapana
9	**Have you ever bought any of the HWTS options that were used during this study?**	**Umeshawahi kununua kifaa/dawa chochote cha kutibu maji kati ya ulivyotumia katika utafiti huu?**
	Yes	Ndiyo

	No	Hapana
10	**Which HWTS options did you buy?**	**Ni kifaa/dawa kipi ulichowagu kununua?**
	Takasa Maji	Takasa Maji
	PUR	PUR
	Liquid chlorine (waterguard)	Waterguard ya maji
	Aquatabs	Waterguard ya kidonge
	Ceramic siphon filter	Kichujamaji cha sifoni
	Ceramic pot filter	Kichujamaji cha udongo
11	**Do you know the real store prices for any of the HWTS options that were used during this study?**	**Unajua bei halali ya kifaa/dawa chochote cha HWTS walichokuwa wanatumia wakati wa utafiti?**
	Yes	Ndiyo
	No	Hapana
12	**For which HWTS options do you know the real store prices?**	**Unajua bei ya kivaa kipi kat ya hivyo vilivyotumiwa?**
	Takasa Maji	Takasa Maji
	PUR	PUR
	Liquid chlorine (waterguard)	Waterguard ya maji
	Aquatabs	Waterguard ya kidonge
	Ceramic siphon filter	Kichujamaji cha sifoni
	Ceramic pot filter	Kichujamaji cha udongo
13	**How often does your family make “smaller” purchases such as soap, or vegetables?**	**Ni wakati gani familia yako hufanya manunuzi "madogo-madogo" kama ya sabuni au mboga za majani?**
	Everyday	Kila siku
	1- 6 times per week	Mara 1-6 kwa juma
	Once every 2 weeks	Mara moja kwa kila majuma 2
	Once a month	Mara moja kwa mwezi
	Less than once a month	Si zaidi ya mara moja kwa mwezi
	Never	Hatujawahi
	I don’t know	Sijui
14	**How often does your family make “larger” purchases, such as water containers, shoes or clothing?**	**Ni wakati gani familia yako hufanya manunuzi "makubwa-makubwa," kama ya vifaa vya kuhifadhia maji, viatu au nguo?**
	More than once a month	Zaidi ya mara moja kwa mwezi
	Once every 1-6 months	Mara moja kila mwezi 1 - miezi 6
	Once every 7 months – 1 year	Mara moja kwa kila miezi 7 - mwaka 1
	Once every 2-3 years	Mara moja kwa kila miaka 2-3
	We haven’t made a “larger” purchase in the last 3 years	Hatujafanya manunuzi "makubwa-makubwa" kwa miaka 3 iliyopita
	Never	Hatujawahi
	I don’t know	Sijui

15	**In the following section I would like to know your position in the decisions for purchasing items for your family. When you can decide yourself, when you depend on your spouse or other member of household, or when you contribute to a decision as to the purchases to be made. Do you understand?**	**Katika sehemu ifuatayo nitapenda kufahamu jinsi unavyoshiriki katika maamuzi ya kununua mahitaji kwa familia yako. Pale ambapo wewe unaakuwa na uamuzi wa moja kwa moja, unapotegemea uamuzi wa mume/mke au mwanafamilia mwingine, ama unapochangia katika maamuzi ya vitu vya kununua. Je umeelewa?**
	Yes	Ndiyo
	No	Hapana
16	**When your family makes "smaller" purchases such as soap, or vegetables, how often do you make the decision by yourself of what to buy?**	**Wakati familia yako inapofanya manunuzi "madogo madogo" kama sabuni, mafuta ya taa, au mboga za majani. Ni mara ngapi unafanya uamuzi mwenyewe juu ya kitu kipi ununue?**
	Always	Wakati wote
	Often	Mara kwa mara
	Sometimes	Wakati mwingine
	Occasionally	Mara chache
	Rarely	Kwa nadra sana
	Never	Sijawahi
	I don't know	Sijui
17	**When your family makes "larger" purchases , such as water containers, shoes or clothing how often do you make the decision by yourself of what to buy?**	**Wakati familia yako inapofanya manunuzi "makubwa" kama ya vifaa vya kuhifadhia maji, viatu au nguo. Ni mara ngapi unafanya uamuzi mwenyewe juu ya kitu kipi ununue?**
	Always	Wakati wote
	Often	Mara kwa mara
	Sometimes	Wakati mwingine
	Occasionally	Mara chache
	Rarely	Nadra sana
	Never	Sijawahi
	I don't know	Sijui
18	**If you don't make the decisions by yourself, when your family makes "larger" purchases , such as water containers, shoes or clothing how often do you contribute to the decision of what to buy?**	**Usipofanya uamuzi wewe mwenyewe, familia yako inapofanya manunuzi "makubwa-makubwa" kama ya vifaa vya kuhifadhia maji, viatu au nguo, ni mara ngapi unachangia kwenye maamuzi kuhusu kitu cha kununua?**
	Always	Wakati wote
	Often	Mara zote
	Sometimes	Wakati mwingine
	Occasionally	Mara chache
	Rarely	Nadra sana
	Never	Sijawahi

	I don't know	Sijui
19	**Now I would like to start the Buying Game. To practice, first we will play the Buying Game with this soap. Think about how much this soap is worth to you. Do not tell me that price, just think of it silently in your head. I will give you a moment to think of what you are willing to pay for this item.**	**Sasa nitapenda kuanza Mchezo wa Manunuzi. Kwa kujaribu, kwanza tutacheza Mchezo wa Manunuzi na sabuni hii. Fikiria sabuni hii itakugharimu kiasi gani. Usiniambie bei hiyo, ifikirie kimya kimya. Nitakupa muda wa kufikiria kile unachohiari kulipia bidhaa hii.**
20	**Without telling me what your price is, please tell me, have you thought of your price?**	**Bila kuniambia bei yako ni ipi, tafadhali niambie, je, tayari umeshaifikiria ?**
	Yes	Ndiyo
	No	Hapana
21	**Now I will explain how this game works. I have 6 cards, with 6 different prices on them.**	**Sasa nitakuelezea jinsi mchezo huu unavyochezwa. Mbele yangu nina karata 6 zenye bei 6 tofauti.**
	NOTE: show the "Sabuni" cards, but NOT the prices.	*ILANI: onyesha kadi za sabuni, ila siyo bei.*
22	**I will allow you to bid on this soap. Then, without looking, you will randomly select one of my cards. If your bid is equal to or higher than the price on the card, then you win. If your bid is lower than the price on the card then you lose.**	**Nitapiga mnada sabuni kwako kwa kuruhusu kutaja bei ya uliyotayari kuilipia. Kisha pasipo kuangalia utachagua mojawapo ya karata zenye bei. Kama bei uliyotaja ni sawa au kubwa kuliko ya karata uliyochagua utakuwa umeshinda. Ikiwa bei utakayotaja ni ndogo kuliko ya karata uliyochagua utakuwa umeshindwa.**
23	**If you win, then I will sell you this item, but you will only pay the price on the card. If you lose then you will not be able to buy this item. If you want to purchase this item, then you should bid a price, any price. If you have no desire to pay for this item, then you should bid zero.**	**Kama ukishinda, hapo nitakuuzia bidhaa hii, lakini utalipia bei iliyoko kwenye karata. Ukishindwa, hautaweza kununua bidhaa hii. Ukitaka kununua bidhaa hii, hapo unapaswa kuotea bei yeyote. Kama hupendi kulipia bidhaa hii, hapo utaotea sifuri.**
24	**For this soap, what is your bid?**	**Kwa sabuni hii, zabuni yako ni ipi?**
25	**What price did they pick?**	**Je wamechagua bei ipi?**
	NOTE: Mix the cards. Then allow them to pick a price from the soap cards.	*KUMBUKA: Changa/changanya karata kisha waruhusu kuchagua toka kadi za sabuni.*
	50	50
	100	100
	150	150
	200	200
	250	250
	300	300
26	**You have won. Would you like to purchase/trade for this soap?**	**Umeshinda. Ungependa kununua/kubadilishana na sabuni hii?**
	Yes	Ndiyo
	No	Hapana

27	**For this soap you have lost. I will keep my item. Do you have any questions?**	**Kwa sabuni hii Umepoteza/Umeshindwa. Nitatunza bidhaa yangu. Je, una swali lolote?/Je, una maswali?**
	Yes	Ndiyo
	No	Hapana
28	**(Don't read this screen out loud)**	**(Usisome kwa sauti)**
	NOTE: Please answer any questions that they have, and review the rules of the game if necessary.	*KUMBUKA:Tafadhari jibu maswali yote waliyokuuliza and hakikisha unafuata sheria zote za mcchezo*
29	**Which 4 HWTS has this household used during this study?**	**Je, ni njia ipi ya kutibu maji kati ya hizi 4 ambayo kaya hii imetumia wakati wa utafiti huu?**
	Cloth Filtration + Boiling	Kuchuja kwa kitambaa + Kuchemsha
	Takasa Maji	Takasa Maji
	PUR	PUR
	Liquid chlorine (waterguard)	Waterguard ya maji
	Aquatabs	Waterguard ya kidonge
	Ceramic siphon filter	Kichujamaji cha sifoni
	Ceramic pot filter	Kichujamaji cha udongo
30	**(Don't read this screen out loud)**	**(Usisome kwa sauti)**
	NOTE: Place the 4 HWTS in front of the participant.	*KUMBUKA: Weka HWTS 4 mbele ya mshiriki.*
31	**You will now be allowed to bid on 4 HWTS. If your bid for 2 or more items is greater than the card that you selected, you will have the option to buy all of those items, or to choose one item to buy. If all of your bids are lower than your random choices you would have lost in you bids.**	**Sasa utaruhusiwa kutaja bei yako kwa njia zote 4 za matibabu. Kama bei yako kwa bidhaa 2 au zaidi ni kubwa kuliko kiwango ulichochagua, utakuwa na hiyari ya kununua bidhaa hizo, au kuchagua bidhaa mojawapo ya kununua. Kama viwango vyako vyote havitoshelezi, utakuwa umepoteza mchezo.**
	NOTE: Describe all four HWTS.	*KUMBUKA: Elezea njia zote nne za matibabu.*
32	**Do you have any questions?**	**Je, una swali lolote?/ Je, una maswali?**
	Yes	Ndiyo
	No	Hapana
33	**(Don't read this screen out loud)**	**(Usisome kwa sauti)**
	NOTE: Please answer any questions that they have, and review the rules of the game if necessary.	*KUMBUKA:Tafadhari jibu maswali yote waliyokuuliza and hakikisha unafuata sheria zote za mcchezo*
34	**For the siphon filter only, you have the option to trade using cash, mobile money or chickens. Would you prefer to play using cash, mobile money or chickens?**	**Kwa kichujamaji cha sifoni tu, unaweza kubadilishana na pesa taslimu, malipo kwa njia ya simu au kuku. Je, ungependa kucheza kwa kutumia pesa taslimu, vocha za simu, au kwa kubadilishana na kuku?**
	Cash	Pesa taslimu
	Mobile credit	Malipo kwa njia ya simu
	Chickens	Kuku

35	**For the pot filter only, you have the option to trade using cash, mobile money or chickens. Would you prefer to play using cash, mobile credit or chickens?**	**Kwa kichujamaji cha udongo tu, unaweza kubadilishana na pesa taslimu, malipo kwa njia ya simu au kuku. Je, ungependa kucheza kwa kutumia pesa taslimu, malipo kwa njia ya simu, au kwa kubadilishana na kuku?**
	Cash	Pesa taslimu
	Mobile credit	Malipo kwa njia ya simu
	Chickens	Kuku
36	**Think about how much you would be willing to give me for these items, and let that guide you. I will give you a moment to think about how much you are willing to give for the following items.**	**Fikiria uko tayari kulipa kiasi gani kwa bidhaa hizi, na acha kiasi hicho kikuongoze. Usiniambie bei hiyo, ifikirie kimya kimya. Nitakupa muda wa kufikiria kiasi ulicho tayari kulipia kwa bidhaa zifuatazo.**
37	**Without telling me what your prices are, please tell me, have you thought of your prices?**	**Bila kuniambia bei yako, tafadhali niambie, kama tayari umeshaifikiria?**
	Yes	Ndiyo
	No	Hapana
38	**Each item has 10 cards, with a different price or number of chickens on each card. I will allow you one bid for each of these four items. Then, without looking, you will randomly select one card for each item. If your bid is equal to or higher than the price or the number of chickens on the card, then you win. If your bid is lower than the price or number of chickens on the card then you lose.**	**Kila kifaa kina karata 10 zenye bei tofauti 10 au idadi ya kuku. Nitakuruhusu kushiriki mara moja kwa kila kifaa. Kisha, pasipo kuangalia, utachagua kiholela karata moja kwa kila kifaa. Kama bei yako au idadi ya kuku ni sawa au juu kuliko ile ya kwenye karata, hapo utakuwa umeshinda. Ikiwa kiwngo chako kitakuwa kidogo kuliko ile bei ya kwenye karata au idadi ya kuku, utakuwa umeshindwa.**
39	**If you win, then I will sell you the item for which you have won, but you will only pay the price or trade the number of chickens on the card. If you win more than once then you can either buy/trade for those 2 or 3 items, or you may choose only one of them. If you lose then you will keep your money or chickens and I will keep my item. If you want one of these items, then you should offer something. If you have no desire for an item, then you should bid zero for that item.**	**Ukishinda, hapo nitakuuzia bidhaa ulizojishindia, lakini utalipa bei niliyonayo katika bahasha tu au idadi ya kuku. Ukishinda zaidi ya mara moja hapo unaweza ama kununua bidhaa zote 2 au 3, au unaweza kuchagua bidhaa mojawapo. Ukishindwa, utakuwa umepoteza mchezo. Ukitaka kununua mojawapo ya bidhaa hizi, hapo unapaswa kuotea bei au idadi ya kuku, bei yeyote. Kama huna nia ya kulipia bidhaa yoyote, utaotea sifuri kwa bidhaa hiyo.**
40	**For these 5 packets of PUR, what is your bid?**	**Kwa paketi hizi 5 za PUR, zabuni yako ni ipi?**
41	**What is the price on the card?** *NOTE: Allow them to pick a price from the "PUR" cards.*	**Je karata inabei gani?** *KUMBUKA: Waruhusu kuchukua bei mojawapo kutoka karata za PUR.*
	50	50
	100	100
	200	200
	300	300
	400	400

	500	500
	600	600
	700	700
	900	900
	1000	1000
42	**For these 5 packets of Takasa Maji, what is your bid?**	**Kwa paketi hizi 5 za Takasa Maji, zabuni yako ni ipi?**
43	**What is the price on the card?**	**Je karata inabei gani?**
	NOTE: Allow them to pick a price from the "Takasa Maji" cards.	*KUMBUKA: Waruhusu kuchukua bei mojawapo kutoka karata za Takasa Maji.*
	50	50
	100	100
	200	200
	300	300
	400	400
	500	500
	600	600
	700	700
	900	900
	1000	1000
44	**For one bottle of Waterguard (liquid), what is your bid?**	**Kwa chupa moja ya Waterguard ya maji, zabuni yako ni ipi?**
45	**What is the price on the card?**	**Je karata inabei gani?**
	NOTE: Allow them to pick a price from the "Waterguard ya maji" cards.	*KUMBUKA: Waruhusu kuchukua bei mojawapo kutoka karata za Water Guard ya maji.*
	50	50
	100	100
	200	200
	300	300
	400	400
	500	500
	600	600
	700	700
	900	900
	1000	1000
46	**For these 10 tablets of Waterguard (Tablets), what is your bid?**	**Kwa vidonge 10 vya Waterguard ya kidonge, zabuni yako ni ipi?**
47	**What is the price on the card?**	**Je karata inabei gani?**
	NOTE: Allow them to pick a price from the "Waterguard ya kidonge" cards.	*KUMBUKA: Waruhusu kuchukua bei mojawapo kutoka karata za Water Guard ya kidonge.*
	50	50

	100	100
	200	200
	300	300
	400	400
	500	500
	600	600
	700	700
	900	900
	1000	1000
48	**For the Siphon Filter, what is your bid?**	**Kwa kichujamaji cha Sifoni, zabuni yako ni ipi?**
49	**What is the price on the card?**	**Je karata inabei gani?**
	NOTE: Allow them to pick a price from the "kichujamaji cha sifoni" cards.	*KUMBUKA: Waruhusu kuchukua bei mojawapo kutoka karata za kichujamaji cha sifoni.*
	500	500
	1000	1000
	1500	1500
	2000	2000
	2500	2500
	3000	3000
	3500	3500
	4000	4000
	5000	5000
	10000	10000
50	**For the Pot Filter, what is your bid?**	**Kwa kichujamaji cha udongo, zabuni yako ni ipi?**
51	**What is the price on the card?**	**Je karata inabei gani?**
	NOTE: Allow them to pick a price from the "Chujio ya Udongo (Tsh)" cards.	*KUMBUKA: Waruhusu kuchukua bei mojawapo kutoka karata za Kichujamaji cha udongo.*
	1000	1000
	2000	2000
	3000	3000
	4000	4000
	5000	5000
	6000	6000
	8000	8000
	10000	10000
	15000	15000
	20000	20000
52	**For the Siphon Filter, how many chickens are you willing to trade?**	**Kwa kichujamaji cha Sifoni, je yuko tayari kubadilishan na kuku wangapi?**
53	**How many chickens are on the card?**	**Je karata inakuku wangapi?**

	NOTE: Allow them to pick a price from the "Chujio ya Sifoni" cards.	*KUMBUKA: Waruhusu kuchukua bei mojawapo kutoka karata za Kichujamaji cha Sifoni.*
	1	1
	2	2
54	**For the Pot Filter, how many chickens are you willing to trade?**	**Kwa Kichujamaji cha udongo, je yuko tayari kubadilishan na kuku wangapi?**
55	**How many chickens are on the card?**	**Je karata inakuku wangapi?**
	NOTE: Allow them to pick a card from the "Chujio ya Udongo (Kuku)" cards.	*KUMBUKA: Waruhusu kuchukua bei mojawapo kutoka karata za Kichujamaji cha udongo.*
	1	1
	2	2
	3	3
56	**For PUR, you have won. Would you like to purchase the PUR?**	**Umeshinda PUR, unahitaji kununua PUR?**
	NOTE: If yes, take the cash, record the amount on your sheet, then give them the PUR.	*KUMBUKA: Kama ndiyo,chukua pesa, andika bei kwenye karatasi yako, wape PUR.*
	Yes	Ndiyo
	No	Hapana
	I promise to pay later	Nahidi kulipia baadaye
57	**For PUR you have lost. I will keep my PUR.**	**Umeshindwa PUR, nitahifadhi PUR yangu.**
58	**For Takasa Maji, you have won. Would you like to purchase the Takasa Maji?**	**Umeshinda Takasa Maji, unahitaji kununua Takasa Maji?**
	NOTE: If yes, take the cash, record the amount on your sheet, then give them the Takasa Maji.	*KUMBUKA: Kama ndiyo,chukua pesa, andika bei kwenye karatasi yako, wape Takasa Maji.*
	Yes	Ndiyo
	No	Hapana
	I promise to pay later	Nahidi kulipia baadaye
59	**For Takasa Maji you have lost. I will keep my Takasa Maji**	**Umeshindwa Takasa Maji, nitahifadhi Takasa Maji yangu.**
60	**For Waterguard liquid, you have won. Would you like to purchase the Waterguard liquid?**	**Umeshinda Waterguard ya maji, unahitaji kununua Waterguard ya maji?**
	NOTE: If yes, take the cash, record the amount on your sheet, then give them the Waterguard liquid.	*KUMBUKA: Kama ndiyo,chukua pesa, andika bei kwenye karatasi yako, wape Waterguard ya maji.*
	Yes	Ndiyo
	No	Hapana
	I promise to pay later	Nahidi kulipia baadaye
61	**For Waterguard liquid, you have lost. I will keep my Waterguard liquid.**	**Umeshindwa Waterguard ya maji, nitahifadhi Waterguard ya maji yangu.**
62	**For Waterguard Tablets, you have won. Would you like to purchase the Waterguard Tablets?**	**Umeshinda Waterguard ya kidonge, unahitaji kununua Waterguard ya kidonge?**
	NOTE: If yes, take the cash, record the amount on your sheet, then give them the Waterguard Tablets.	*KUMBUKA: Kama ndiyo,chukua pesa, andika bei kwenye karatasi yako, wape Waterguard ya kidonge.*
	Yes	Ndiyo
	No	Hapana

	I promise to pay later	Nahidi kulipia baadaye
63	**For Waterguard tablets you have lost. I will keep my Waterguard tablets.**	**Umeshindwa Waterguard ya kidonge, nitahifadhi Waterguard ya kidonge yangu.**
64	**For the siphon filter, you have won. Would you like to purchase the siphon filter?**	**Umeshinda kichujamaji cha sifoni, unahitaji kununua Kichujamaji cha sifoni?**
	NOTE: If yes, take the cash or mobile credit, record the amount on your sheet, then give them the siphon filter.	*KUMBUKA: Kama ndiyo,chukua pesa, andika bei kwenye karatasi yako, wape kichujamaji cha sifoni.*
	Yes	Ndiyo
	No	Hapana
	I promise to pay later	Nahidi kulipia baadaye
65	**For the siphon filter, you have lost. I will keep my siphon filter.**	**Umeshindwa kichujamaji cha sifoni, nitahifadhi kichujamaji cha sifoni yangu.**
66	**For the pot filter, you have won. Would you like to purchase the pot filter?**	**Umeshinda kichujamaji cha udongo, unahitaji kununua kichujamaji cha udongo?**
	NOTE: If yes, take the cash or mobile credit, record the amount on your sheet, then give them the pot filter.	*KUMBUKA: Kama ndiyo,chukua pesa, andika bei kwenye karatasi yako, wape kichujamaji cha udongo.*
	Yes	Ndiyo
	No	Hapana
	I promise to pay later	Nahidi kulipia baadaye
67	**For the pot filter you have lost. I will keep my pot filter.**	**Umeshindwa kichujamaji cha udongo, nitahifadhi kichujamaji cha udongo changu.**
68	**For the siphon filter, you have won. Would you like to trade for the siphon filter?**	**Umeshinda kichujamaji cha sifoni, utapenda kuuziwa kichujamaji cha sifoni?**
	NOTE: If yes, take the chickens, record the number of chickens on your sheet, then give them the siphon filter.	*KUMBUKA: Kama jibu lake ni ndiyo, andika idadi ya kuku katika karatasi yako, halafu umpe kichuja maji cha sifoni.*
	Yes	Ndiyo
	No	Hapana
69	**For the siphon filter, you have lost. I will keep my siphon filter.**	**Umeshindwa kichujamaji cha sifoni, nitahifadhi kichujamaji cha sifoni changu.**
70	**For the pot filter, you have won. Would you like to trade for the pot filter?**	**Umeshinda kichujamaji cha udongo, utapenda kuuziwa kichujamaji cha udongo?**
	NOTE: If yes, take the chickens, record the number of chickens on your sheet, then give them the pot filter.	*KUMBUKA: Kama jibu lake ni ndiyo, andika idadi ya kuku katika karatasi yako, halafu umpe kichuja maji cha udongo.*
	Yes	Ndiyo
	No	Hapana
71	**For the pot filter you have lost. I will keep my pot filter.**	**Umeshindwa kichujamaji cha udongo, nitahifadhi kichujamaji cha udongo yangu.**
72	**Please tell me why did you choose to play with cash?**	**Tafadhari unaweza kuniambia kwanini umechagua kucheza kwa kutumia hela?**
	I don't have any chickens	Sina kuku yoyote
	I have chickens but I want to keep them	Nina kuku lakini nataka kutunza
	Cash is easier	Pesa taslimu ni rahisi

	I don't have mobile money	Sina malipo ya simu
	Chickens are worth a lot of money	Kuku wanagharimu hela nyingi
	Other	nyingine
	I don't know	sijui
73	**Please specify what other reason was given for choosing cash.**	**Tafadhali taja sababu walizozitaja kwanini wamechagua hela.**
74	**Please tell me why did you choose to play with mobile money?**	**Tafadhari unaweza kuniambia kwanini umechagua kucheza kwa kutumia malipo ya simu?**
	I don't have any chickens	Sina kuku yoyote
	I have chickens but I want to keep them	Nina kuku lakini nataka kutunza
	Mobile money is easier	malipo ya simu ni rahisi
	Mobile money is safer	malipo kwa kutumia simu ni salama zaidi
	I don't have cash	Sina pesa taslimu
	Chickens are worth a lot of money	Kuku wanagharimu hela nyingi
	Other	nyingine
	I don't know	sijui
75	**Please specify what other reason was given for choosing mobile money**	**Tafadhali taja sababu walizozitaja kwanini wamechagua hela ya simu.**
76	**Please tell me why did you choose to play with chickens?**	**Tafadhari niambie kwanini umeamua kucheza kwa kuku?**
	I don't have any cash	Sina pesa taslimu
	I don't have any mobile money	Sina malipo ya simu
	I have cash/mobile money but I want to keep it	Nina hela/hela kwa simu lakini nataka kutunza.
	Chickens are easier	kuku ni rahisi
	Chickens are safer	Kuku ni salama zaidi
	Chickens are not worth a lot of money	Kuku hawachukui hela nyingi
	Other	nyingine
	I don't know	sijui
77	**Please specify what other reason was given for choosing chickens**	**Tafadhali taja sababu walizozitaja kwanini wamechagua kuku.**
78	**Please tell me why did you not choose to play with cash?**	**Tafadhari unaweza kuniambia kwanini humechagua kucheza kwa kutumia hela?**
	I don't have any chickens	Sina kuku yoyote
	I have chickens but I want to keep them	Nina kuku lakini nataka kutunza
	Cash is easier	Pesa taslimu ni rahisi
	I don't have mobile money	Sina malipo ya simu
	Chickens are worth a lot of money	Kuku wanagharimu hela nyingi
	Other	nyingine
	I don't know	sijui
79	**Please specify what other reason was given for not choosing cash.**	**Tafadhali taja sababu walizozitaja kwanini hawamechagua hela.**

80	**Please tell me why did you not choose to play with mobile money?**	**Tafadhari unaweza kuniambia kwanini humechagua kucheza kwa kutumia malipo ya simu?**
	I don't have any chickens	Sina kuku yoyote
	I have chickens but I want to keep them	Nina kuku lakini nataka kutunza
	Mobile money is easier	malipo ya simu ni rahisi
	Mobile money is safer	malipo kwa kutumia simu ni salama zaidi
	I don't have cash	Sina pesa taslimu
	Chickens are worth a lot of money	Kuku wanagharimu hela nyingi
	Other	nyingine
	I don't know	sijui
81	**Please specify what other reason was given for not choosing mobile money**	**Tafadhali taja sababu walizozitaja kwanini hawamechagua malipo ya simu.**
82	**Please tell me why did you not choose to play with chickens?**	**Tafadhari niambie kwanini humeamua kucheza kwa kuku?**
	I don't have any cash	Sina pesa taslimu
	I don't have any mobile money	Sina malipo ya simu
	I have cash/mobile money but I want to keep it	Nina hela/hela kwa simu lakini nataka kutunza.
	Chickens are easier	kuku ni rahisi
	Chickens are safer	Kuku ni salama zaidi
	Chickens are not worth a lot of money	Kuku hawachukui hela nyingi
	Other	nyingine
	I don't know	sijui
83	**Please specify what other reason was given for not choosing chickens**	**Tafadhali taja sababu walizozitaja kwanini hawamechagua kuku.**
84	**We have completed the buying game. Thank you for participating!**	**Umemaliza kucheza game. Asante kwa kushiriki.**
85	**Collect the GPS coordinates of this house.**	**Chukua taarifa za kijiografia (GPS) za eneo husika**

Appendix D: Summary Statistics for Variables Collected in Hubli-Dharwad

Note: We collected additional variables that are part of the survey included in Appendix B, but are not listed here, if they were intended for other research topics outside of the scope of this dissertation. Those research topics included a health impact study, a water quality impact analysis and a cost-benefit analysis.

Household Characteristics	
Wealth Quartiles	*Number of Households*
Lowest	1958
2nd	2219
3rd	2273
Highest	2030
Borewell Access and Usage	
	Mean
Distance to Borewell (Km)	0.84
Distance to Borewell	*% of Households*
0.1 Km or less	32.3%
>0.1 Km & 1 Km or less	37.8%
> 1 Km	29.8%
	% of Households
Used Public Borewell in Previous Month	18.3%
Waiting for Water Deliveries	
Last time the water was late, did you miss social, religious, civic or leisure activities in order to wait for the water?	*% of Households*
Round 1	28.1%
Round 2	24.1%
Round 3	33.6%
Round 4	12.6%
Any Round	53.5%
Household Water Treatment	
	% of Households
Currently, do you do anything to your drinking water to make it better for your children?	55.6%
Currently, what do you do to make your drinking water better for your children? (Asked in Round 1)	*% of Households*

Boil	26.7%
Add Chlorine Tablets	0.0%
Strain through cloth	21.6%
Use Candle Filter	9.2%
Use Pureit Filter	5.1%
Use Other Commercial Filter	0.4%
Use Other Treatment	0.7%

Appendix E: Summary Statistics for Variables Collected in Tanzania

Household Characteristics	
What is your age, in years?	39.4
% of respondents identifying as women	74%
How many chickens or ducks do you currently own?	7.1
Did you attend a community meeting about water safety a few weeks ago?	61%
Water Sources: Types, Turbidity and Uses	
I am going to read you a list of water sources. Please tell me which sources best describe the sources that you used in the last two weeks?	*% of Participants*
Private tube well / bore well	12%
Private dug well	6%
Public tube well / bore well	13%
Public dug well	58%
river/stream/spring	1%
pond/lake/dam	3%
Stored rainwater	18%
Tanker / vender	0%
Other/None of the above	6%
Currently, which is your main source?	*% of Participants*
Private tube well / bore well	2%
Private dug well	4%
Public tube well / bore well	5%
Public dug well	70%
river/stream/spring	1%
pond/lake/dam	2%
Stored rainwater	10%
Tanker / vender	0%
Other/None of the above	6%
The last time you collected water, what was the colour of the water from the private tube well / bore well?	*% of Participants*
Clear (no color)	97%
Cloudy (milky)	3%
Brown/ muddy	0%
Blackish	0%
Red/ rusty	0%
Green	0%
Other/None of the above	0%

The last time you collected water, what was the colour of the water from the private dug well?	*% of Participants*
Clear (no color)	77%
Cloudy (milky)	18%
Brown/ muddy	4%
Blackish	0%
Red/ rusty	0%
Green	0%
Other/None of the above	0%
The last time you collected water, what was the colour of the water from the public tube well / bore well?	*% of Participants*
Clear (no color)	58%
Cloudy (milky)	40%
Brown/ muddy	0%
Blackish	0%
Red/ rusty	1%
Green	0%
Other/None of the above	0%
The last time you collected water, what was the colour of the water from the public dug well?	*% of Participants*
Clear (no color)	42%
Cloudy (milky)	53%
Brown/ muddy	2%
Blackish	1%
Red/ rusty	2%
Green	0%
Other/None of the above	0%
The last time you collected water, what was the colour of the water from your surface water source (river / stream / spring / lake / pond / dam)?	*% of Participants*
Clear (no color)	70%
Cloudy (milky)	18%
Brown/ muddy	3%
Blackish	1%
Red/ rusty	1%
Green	7%
Other/None of the above	0%
The last time you collected water, what was the colour of the water from your rainwater storage?	*% of Participants*
Clear (no color)	97%
Cloudy (milky)	1%

Brown/ muddy	0%
Blackish	2%
Red/ rusty	0%
Green	0%
Other/None of the above	0%
The last time you collected water, what was the colour of the water from the tanker / vender?	*% of Participants*
Clear (no color)	47%
Cloudy (milky)	50%
Brown/ muddy	0%
Blackish	1%
Red/ rusty	2%
Green	0%
Other/None of the above	1%
In the last two weeks, for which of the following activities did you use water from the private tube well / bore well?	*% of Participants*
Drinking	99%
Cooking	98%
Bathing	98%
Animals	34%
Washing /laundry	98%
Other/None of the above	0%
In the last two weeks, for which of the following activities did you use water from the private dug well?	*% of Participants*
Drinking	97%
Cooking	98%
Bathing	97%
Animals	26%
Washing /laundry	93%
Other/None of the above	0%
In the last two weeks, for which of the following activities did you use water from the public tube well / bore well?	*% of Participants*
Drinking	98%
Cooking	98%
Bathing	97%
Animals	31%
Washing /laundry	92%
Other/None of the above	0%
In the last two weeks, for which of the following activities did you use water from the public dug well?	*% of Participants*

Drinking	98%
Cooking	96%
Bathing	95%
Animals	35%
Washing /laundry	92%
Other/None of the above	0%
In the last two weeks, for which of the following activities did you use water from your surface water source (river / stream / spring / lake / pond / dam)?	*% of Participants*
Drinking	85%
Cooking	93%
Bathing	92%
Animals	40%
Washing /laundry	90%
Other/None of the above	0%
In the last two weeks, for which of the following activities did you use water from your rainwater storage?	*% of Participants*
Drinking	96%
Cooking	96%
Bathing	92%
Animals	44%
Washing /laundry	92%
Other/None of the above	1%
In the last two weeks, for which of the following activities did you use water from the tanker / vender?	*% of Participants*
Drinking	97%
Cooking	93%
Bathing	88%
Animals	14%
Washing /laundry	85%
Other/None of the above	1%
Time Costs of Collection	
How many times did your household collect water from a tanker in the last month?	1.7
For the following questions, households that used rainwater or a tanker as their main source were not included.	
How many times did your household collect water from this source yesterday?	2.3
On average, how many buckets of water did you collect for each trip to this source?	2.7
Normally, during a single trip to your source, how many people are needed to fetch water?	1.7
On average, how long does it take to walk to the source, wait in the cue, get water, and return? (Minutes)	62.3
Observations of Drinking Water Storage	

When you asked to see their drinking water storage, what did they show you?	*% of Participants*
Safe Storage Container from this study	79%
Pot Filter Container	6%
Bucket 10lts	0%
Bucket 20lts	13%
Ceramic pot	2%
Gerry can 5 - 20lt	0%
Large vesel (> 20 liters)	1%
Other	0%

What are the openings on this container?	*% of Participants*
Opening on top, narrow (no hands fit)	3%
Opening on top, wide (hands fit)	58%
Opening on bottom, spigot	94%
Other	0%

Is this container covered?	*% of Participants*
Completely covered by lid or plate	97%
Partially covered by lid or plate	1%
Completely covered by a cloth	2%
Partially covered by a cloth	0%
Not covered	0%

Where is this container located?	*% of Participants*
On floor/ground	3%
Elevated, below 1 m	49%
Elevated, above 1 m	47%

Do you see any of the following near the container?	*% of Participants*
Animals	0%
Dust/Dirt	20%
Toilet	0%
Excrement	0%
I do not see anything around it	69%
Other	14%

When was the last time you refilled this container?	*% of Participants*
Today	11%
Yesterday	32%

The day before yesterday	36%
Three days ago	10%
More than three days ago	12%

We asked them to obtain a cup of drinking water, in the same way that they would for their children, and made the following observations:

How did they obtain this cup of water?	*% of Participants*
Dipped cup in container	8%
Ladled from container	0%
Poured from container	0%
Filled from tap	92%
Other	0%
Is the water clear? (% of observations that were clear)	89%

We asked them to rate the cock which was attached to the safe storage container that we provided for them. (4 = Easy, 3 = A little bit difficult, 2 = Difficult, 3 = Very Difficult)

Please tell me the difficulty of using this tap for you.	3.84
Please tell me the difficulty of using this tap for your children.	3.26

Perceptions of Safety (asked while standing next to their drinking water storage)

Did anyone treat this water in any way? (% of participants that said 'Yes')	95%
Is your drinking water safe for you to drink right now? (% of participants that said 'Yes')	98%

How would you know if this water was safe to drink?	*% of Participants*
Clear so it is clean	8%
Not rainy season so it is clean	1%
No one gets sick	17%
Source is clean, so this water is clean	3%
It's not clean, but they should get used to it	0%
I boiled/filtered/added chlorine to it/added alum to it.	87%
Other	8%

How would you know if this water was not safe to drink?	*% of Participants*
Not Clear so it is not clean	3%
Rainy season so it is not clean	0%
Source is not clean, so this water is not clean	5%
It's not clean, but they should get used to it	2%
I didn't boil/filter/add chlorine to it/add alum to it.	75%
The children are sick	2%
Other	20%

Household Drinking Water Treatment		
	Beginning of Each Round	***End of Each Round***
Household treated drinking water at least once in the last 2 weeks	91%	96%
What are the main reasons you do not treat the water before drinking?	*% of Participants*	
Water is already clean	7%	10%
Treatment does not help	6%	8%
Treating water is unnecessary	3%	2%
Too expensive	14%	6%
No time	16%	12%
Bad taste	5%	18%
Don't know how	32%	6%
There are no microbes	18%	0%
Other	33%	63%
What are the main reasons you treat the water before drinking?	*% of Participants*	
Water is not clean	24%	43%
Treatment helps	25%	31%
Treating water is necessary	22%	24%
Not too expensive	1%	2%
Does not take too much time	3%	2%
Good taste	4%	4%
I know how	14%	12%
There are microbes	61%	50%
Other	19%	17%
In the last two weeks, what household members treated water? (as a % of households that contained members from each of the specified groups)	*% of Participants*	
Adult Women (>18 years)	98%	96%
Adult Men (>18 years)	57%	22%
Female children (<18 years)	35%	10%
Male children (<18 years)	22%	5%
In the last two weeks, who drank the treated water? (as a % of households that contained members from each of the specified groups)	*% of Participants*	
Adult Women (>18 years)	100%	99%
Adult Men (>18 years)	97%	89%
Female children 5 - 18 years	90%	69%
Male children 5 - 18 years	90%	70%
Female children less than 5 years	78%	45%
Male children less than 5 years	76%	43%

In the last 2 weeks how many times were the following HWTS used?	*Mean*	
cloth filtration	2.8	3.3
boiling	2.3	3.2
alum	2.0	3.0
water purifier (Takasa Maji)	2.6	3.5
PUR	2.4	3.2
Waterguard (liquid)	2.2	3.0
Waterguard (tablets)	2.3	3.1
ceramic siphon filter	2.2	3.0
ceramic pot filter	2.3	3.0
sand filter	0.0	0.0
solar disinfection (SODIS)	0.0	0.0
three pot system	0.0	0.0

Knowledge of Proper Use of the Assigned HWTS	
We asked participants to tell us the correct instructions for their assigned HWTS at the end of each round. Here we present the % of participants that mentioned each particular step.	
Knowledge about Boiling	*% of Participants*
Step 1: Filter the water through a clean cloth	86%
Step 2: Place the pot with the water on the fire.	99%
Step 3: Make sure the water reaches a rolling boil.	96%
Step 4: The water should boil for 5 minutes.	89%
Step 5: Take the pot off the fire and allow it to cool in a clean place.	97%
Step 6: Pour the water into a safe storage container.	98%
Knowledge about PUR	*% of Participants*
Step 1: Fill a small bucket with water (10 liters).	99%
Step 2: open your packet of PUR and pour the powder into the bucket.	97%
Step 3: Use a clean utensil and stir the water 5 minutes.	98%
Step 4: Wait for another five minutes so that the dust can settle on the bottom.	94%
Step 5: If the water is not yet clear, stir again and leave it to settle.	82%
Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket.	89%
Step 7: Wait for 20 minutes.	94%
Knowledge about Waterguard (liquid)	*% of Participants*
Step 1: Filter the water through a clean cloth	86%

Step 2: Put your water in a jerry can of 20 liters.	99%
Step 3: Add 1 capful of Waterguard to the jerry can if the water is clear.	98%
Step 4: Add 2 capfuls to the jerry can if the water is cloudy.	87%
Step 5: Shake the jerry can for 1 minutes.	95%
Step 6: Wait for half an hour before drinking.	95%

Knowledge about Waterguard (tablets)	*% of Participants*
Step 1: Filter the water through a clean cloth	85%
Step 2: Put your water in a jerry can of 20 liters.	98%
Step 3: Add 1 tablet to the jerry can if the water is clear.	97%
Step 4: Add two tablets to the jerry can if the water is cloudy.	84%
Step 5: Shake the jerry can for 1 minutes.	93%
Step 6: Wait for half an hour before drinking.	94%

Knowledge about the Siphon Filter	*% of Participants*
Step 1: Fill a bucket with water.	95%
Step 2: Put the safe storage bucket on the ground next to the table, at least one meter from the bucket.	96%
Step 3: Put siphon filter in the water.	100%
Step 4: Adjust the tap height with the O-ring.	84%
Step 5: Squeeze the bulb, release the bulb and squeeze the bulb again.	93%
Step 6: Let the clean water flow into the bucket.	90%
Step 7: Wait until the bottom bucket is filled.	85%

Knowledge about the Pot Filter	*% of Participants*
Step 1: Put the filter inside the bucket or in a special container.	97%
Step 2: Pour water inside the filter.	100%
Step 3: Cover the filter and wait for the water to filter.	95%

Knowledge about Takasa Maji	*% of Participants*
Step 1: Fill a small bucket with water (10 liters).	100%
Step 2: Open your packet of Water Treatment and pour the powder into the bucket.	100%
Step 3: Use a clean utensil and stir the water 5 minutes.	99%
Step 4: Wait for another five minutes so that the dust can settle on the bottom.	99%
Step 5: If the water is not yet clear, stir again and leave it to settle.	85%
Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket.	98%
Step 7: Wait for 20 minutes.	98%

What regular maintenance should you do for the Ceramic Pot Filter?	*% of Participants*

Wash the filter	81%
Dip the filter in boiling water	88%
Other	4%
How often should you wash the pot filter?	*% of Participants*
1 time or more per week	76%
1 time every 8 - 14 days	14%
1 time every 15 days or more	6%
Other	5%
You should wash your pot filter with what?	*% of Participants*
Water	100%
Brush	99%
Soap	1%
Ash	0%
Other	0%
How long should you use the pot filter before boiling it again?	*% of Participants*
Less than 3 months	22%
3 months	76%
More than 3 months	1%
Other	1%
Perceived Difficulty of Proper Use of the Assigned HWTS (Asked at the End of Each Round)	
We asked participants to rate the difficulty of each step for their assigned HWTS. (4 = Easy, 3 = A little bit difficult, 2 = Difficult, 3 = Very Difficult)	
Difficulty Rating for Boiling	*Mean*
Step 1: Filter the water through a clean cloth	3.97
Step 2: Place the pot with the water on the fire.	3.97
Step 3: Make sure the water is reaches a rolling boil.	3.97
Step 4: The water should boil for 5 minutes	3.97
Step 5: Take the pot off the fire and allow it to cool in a clean place.	3.97
Step 6: Pour the water into a safe storage container.	3.99
Difficulty Rating for PUR	*Mean*
Step 1: Fill a small bucket with water (10 liters).	3.97
Step 2: open your packet of PUR and pour the powder into the bucket.	3.98
Step 3: Use a clean utensil and stir the water 5 minutes.	3.95
Step 4: Wait for another five minutes so that the dust can settle on the bottom.	3.95
Step 5: If the water is not yet clear, stir again and leave it to settle.	3.94

Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket.	3.97
Step 7: Wait for 20 minutes.	3.95
Difficulty Rating for Waterguard (liquid)	*Mean*
Step 1: Filter the water through a clean cloth	3.98
Step 2: Put your water in a jerry can of 20 liters.	3.98
Step 3: Add 1 capful of Waterguard to the jerry can if the water is clear.	3.98
Step 4: Add 2 capfuls to the jerry can if the water is cloudy.	3.98
Step 5: Shake the jerry can for 1 minutes.	3.95
Step 6: Wait for half an hour before drinking.	3.96
Difficulty Rating for Waterguard (tablet)	*Mean*
Step 1: Filter the water through a clean cloth	3.94
Step 2: Put your water in a jerry can of 20 liters.	3.98
Step 3: Add 1 tablet to the jerry can if the water is clear.	4.00
Step 4: Add two tablets to the jerry can if the water is cloudy.	4.00
Step 5: Shake the jerry can for 1 minutes.	3.94
Step 6: Wait for half an hour before drinking.	3.96
Difficulty Rating for the Siphon Filter	*Mean*
Step 1: Fill a bucket with water.	3.88
Step 2: Put the safe storage bucket on the ground next to the table, at least one meter from the bucket.	3.84
Step 3: Put siphon filter in the water.	3.86
Step 4: Adjust the tap height with the O-ring.	3.81
Step 5: Squeeze the bulb, release the bulb and squeeze the bulb again.	3.84
Step 6: let the clean water flow into the bucket.	3.78
Step 7: Wait until the bottom bucket is filled with water.	3.65
Difficulty Rating for the Pot Filter	*Mean*
Step 1: Put the filter inside the bucket or in a special container.	3.97
Step 2: Pour water inside the filter.	3.99
Step 3: Cover the filter and wait for the water to filter.	3.93
When boiling filter: Step 1: Remove the ceramic filter from the bucket.	3.98
When boiling filter: Step 2: Put your ceramic filter in boiling water.	3.95
When boiling filter: Step 3: Remove your ceramic filter from the hot water and put it in your bucket.	3.91
Difficulty Rating for Takasa Maji	*Mean*
Step 1: Fill a small bucket with water (10 liters).	3.98
Step 2: Open your packet of Water Treatment and pour the powder into the bucket.	3.98
Step 3: Use a clean utensil and stir the water 5 minutes.	3.97
Step 4: Wait for another five minutes so that the dust can settle on the bottom.	3.98
Step 5: If the water is not yet clear, stir again and leave it to settle.	3.97

Step 6: Decant water gently through a clean cotton cloth into the safe water storage bucket.	3.98
Step 7: Wait for 20 minutes.	3.97
Remaining Consumables at the End of Each Round	
How many packets of PUR do you have remaining? (mean)	11.2
How much Waterguard (Liquid) is remaining in their bottle? (in mL)	76.2
How many tablets of Waterguard do you have remaining? (mean)	10.1
How many packets of Water Treatment do you have remaining? (mean)	8.3
Drinking Water Storage Container - Observations Made at the End of Each Round	
We asked our enumerators to observe the drinking water storage containers for our participating households, and mark down what they observed.	*% of Participants*
Container is covered	94%
Container is elevated from the ground	78%
Container has a narrow mouth	11%
Container has a tap	93%