

# Hygiene Promotion for Diarrhoeal Disease Prevention through the Government of Malawi Perinatal Care System

## Program Evaluation Report

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## *Executive Summary*

### **Background**

In Malawi, diarrheal illness is a leading cause of morbidity and mortality in children. Safe storage and treatment of water at the household level, access to and effective use of a sanitation facility, and hand washing with soap reduce the risk of diarrhea. Among women in Malawi, the use of antenatal care services is high, but delivery at a health facility and return for postnatal care remains low, contributing to high maternal and child mortality.

A Safe Water System (SWS) program was launched in Malawi in 2002 by Population Services International (PSI). A locally-produced dilute sodium hypochlorite water treatment product was developed and marketed with the brand name *WaterGuard*. A recent survey of over 1,600 women in Malawi showed that while nearly two-thirds of mothers had heard of *WaterGuard*, usage remained low. Thus, efforts need to be made to increase the rates of use to achieve the desired impact on diarrheal illness. The US Agency for International Development (USAID) sponsored a pilot program in collaboration with UNICEF, the Government of Malawi Ministry of Health (MOH), and PSI, to test the feasibility of promoting hygiene improvement interventions (specifically disinfection and safe storage of water at the point-of-use, and hand washing with soap) through Malawi's antenatal health care system. The purpose of this initiative was to improve maternal health and decrease diarrheal diseases in two districts in Malawi. The pilot program involved the distribution of hygiene kits, including a water storage container with a tap, a bottle of *WaterGuard*, a 500 gram bar of soap, and 2 sachets of ORS, as incentives for pregnant women to come to a hospital or clinic for antenatal care and delivery.

In May and June 2007, the Centers for Disease Control and Prevention (CDC) conducted a baseline survey of women enrolled in this program in the two selected districts, Blantyre and

Salima. This survey assessed water treatment and hygiene practices among the enrolled women and their close relatives or friends with children under 5 years old. In February and March 2008, CDC conducted a follow-up survey to determine changes in water treatment and hygiene practices among the same women after the program period in order to evaluate this pilot program.

## **Results**

In Blantyre District, 231 program participants from 8 health facilities were enrolled in the baseline antenatal clinic survey and 230 relatives or friends were enrolled in the baseline diffusion survey; 182 program participants and 155 relatives or friends were included in the follow-up survey analysis. In Salima District, 158 program participants were enrolled from 7 health facilities in the baseline antenatal clinic survey and 156 relatives or friends were enrolled in the baseline diffusion survey; 148 program participants and 120 relatives or friends were included in the follow-up survey analysis. The median respondent age at baseline was 24 years (range 15 to 45). Program participants were in their 3<sup>rd</sup> to 9<sup>th</sup> month of pregnancy (median 7 months) at the time of enrollment. Forty-three percent of respondents in Blantyre District and 93% of respondents in Salima District were from rural areas. Among all 775 respondents, 33% completed primary school, and 65% reported being able to read. Most women reported a protected water source as their principal source of drinking water at baseline (89%) and at follow-up (88%).

Among program participants, 97% in Blantyre District and 73% in Salima District had heard of *WaterGuard* at baseline; 29% were able to correctly identify both the dose and wait time. At baseline, 24% of program participants from Blantyre District and 25% from Salima District said that they had used *WaterGuard* in the past 2 days. Only 2% of homes exhibited

*WaterGuard* use by having both a *WaterGuard* bottle and a positive chlorine residual from stored water. When program participants were asked to demonstrate how they washed their hands at baseline, 27% used soap and 22% lathered their hands completely with soap.

At follow-up, 100% of Blantyre participants ( $p=0.07$ ) and 99% of Salima participants ( $p<0.0001$ ) had heard of *WaterGuard*; 62% were able to correctly identify the dose and wait time ( $p<0.0001$ ). Fifty-seven percent of Blantyre participants ( $p<0.0001$ ) and 85% of Salima participants ( $p<0.0001$ ) said they had used *WaterGuard* in the past 2 days. At follow-up, 61% of homes had both a *WaterGuard* bottle in the home and a positive chlorine residual from a stored water sample ( $p<0.0001$ ). Assuming that the 2% of participants who had a *WaterGuard* bottle in the home and a positive chlorine residual from stored water at baseline also purchased that *WaterGuard*, a significantly greater percentage of participants exhibited *WaterGuard* purchase and use at follow-up than at baseline. When asked to demonstrate how they washed their hands, 73% used soap ( $p<0.0001$ ) and 68% lathered their hands completely with soap ( $p<0.0001$ ).

Seventy-two percent of program participants had at least three antenatal visits during this pregnancy. Ninety percent of program participants in Blantyre and 59% in Salima delivered in a health facility; 68% of participants in Blantyre and 37% of participants in Salima had documentation of a postnatal check in their health care passbook. Ninety-four percent of the program participants' babies were alive at the time of the follow-up interview. Nearly all babies (91%) had been seen at least once by a health care provider.

Of the 386 relatives and friends, 94% in Blantyre District and 79% in Salima District had heard of *WaterGuard* at baseline; 27% were able to correctly identify both the dose and wait time. Sixteen percent of relatives and friends from Blantyre District and 10% from Salima District said had used *WaterGuard* in the past 2 days. A *WaterGuard* bottle and a positive

chlorine residual from a stored water sample were found in 2% of homes. When relatives and friends were asked to demonstrate how they washed their hands at baseline, 22% used soap and 18% lathered their hands completely with soap. At follow-up, 99% had heard of *WaterGuard* at follow-up ( $p<0.0001$ ); 48% were able to correctly identify both the dose and wait time ( $p<0.0001$ ). Thirty percent from Blantyre ( $p<0.0001$ ) and 53% from Salima ( $p<0.0001$ ) said they had used *WaterGuard* in the past 2 days. At follow-up, 25% of relatives' or friends' homes had both a *WaterGuard* bottle in the home and a positive chlorine residual from a stored water sample ( $p<0.0001$ ). Assuming that the 2% of relatives and friends who has a *WaterGuard* bottle in the home and a positive chlorine residual from a stored water at baseline also purchased that *WaterGuard*, a significantly greater percentage exhibited a *WaterGuard* purchase and use at follow-up than at baseline ( $p<0.0001$ ). When relatives or friends were asked to demonstrate how they washed their hands at follow-up, 66% used soap ( $p<0.0001$ ) and 60% lathered their hands completely with soap ( $p<0.0001$ ).

Program cost was \$2.80 per household member protected by *WaterGuard* use and \$5.34 per household member protected by *WaterGuard* use and purchasing *WaterGuard*.

## **Conclusions**

This evaluation demonstrates that Malawi's antenatal care system is a very effective platform for promoting key hygiene behaviors among mothers. The program evaluation showed significant increases in knowledge about *WaterGuard*, reported *WaterGuard* use, observed *WaterGuard* use, and *WaterGuard* purchase among program participants in both districts after the program period. There were also significant increases in hand washing knowledge and ability to demonstrate correct hand washing procedures among these program participants.

In addition to improvements in water treatment and hygiene practices, the evaluation also noted additional program benefits. Program participants had high use of antenatal, delivery, postnatal, and newborn health services, which could also improve maternal and child health. Finally, the evaluation also showed significant improvements in water treatment and hand washing practices among the friends and relatives of program participants, demonstrating diffusion of the intervention into the community, particularly among other women with children under 5 years who are at highest risk of diarrhea.

## **Recommendations**

### ***Program recommendations***

- Program continuation in Blantyre and Salima Districts, and expansion of program to other districts in Malawi with interim evaluation
- Future program expansion should include education components by nurses in the health facilities and HSAs during home visits, encouraging HSAs to conduct program monitoring during home visits.
- Initiate a pilot program for promotion of key hygiene behaviors through the expanded program in immunizations (EPI)

### ***Research and evaluation recommendations***

- Conduct stratified analysis to determine the impact of demographics, socioeconomic characteristics, program participation, and other factors on the adoption of SWS and hand hygiene practices during the program period.
- Conduct an evaluation to determine whether the EPI program is also an effective health-facility-based platform for promoting key hygiene behaviors, and whether providing additional refills during childhood immunizations can demonstrate or augment the water

treatment and hygiene behavior changes observed with the antenatal clinic platform alone.

- If program scale-up is planned, conduct an interim evaluation using similar methodology to help guide future scale-up.
- During either the evaluation of the EPI program or during evaluation of future antenatal clinic program scale-up efforts, consider re-evaluating the communities involved in this pilot program to determine whether behavior changes were sustained over time.

## *Detailed Report*

### **Background**

#### *Diarrhea and water quality*

Diarrheal illness is a leading cause of childhood mortality in the developing world, with an estimated 1.7 million dying of waterborne diseases each year (1). Drinking water that is contaminated with a pathogen is an important vehicle for diarrheal disease transmission in developing countries. There are three key practices that have been shown to be effective in reducing the risk of diarrheal diseases. Safe storage and treatment of water at the household level, access to and effective use of a sanitation facility (such as a latrine), and hand washing with soap will each typically reduce the risk of diarrhea by approximately 30-40% (2).

#### *The Safe Water System*

The U.S. Centers for Disease Control and Prevention (CDC) and the Pan American Health Organization/World Health Organization (PAHO/WHO) developed the Safe Water System (SWS) to address the need for inexpensive, adaptable, appropriate, alternative means of water treatment and storage in the short- to medium-term to reduce diarrhea risk in the developing world (3-6). The SWS consists of water treatment at the point of use with a locally-produced, dilute sodium hypochlorite solution, promotion of safe water storage, and behavior change techniques such as social marketing (4). The SWS has been shown to decrease diarrhea risk by 25% to 85% and has been implemented in over 20 countries (7-12).

#### *Health indicators in Malawi*

In Malawi, women make up 51% of the total population, and 42% of these women are of reproductive age (15-49 years old). Ninety-three percent of pregnant women receive antenatal care from a skilled provider, either a nurse or midwife (82%) or a physician (10%) (13). While

the use of antenatal services is high, delivery at a health facility remains relatively low at 57%. Similarly, very few mothers (7%) report back to the health facility for postnatal checks after 1 week following delivery (13). Poor attendance at health facilities for delivery and postnatal checks is an important factor contributing to a very high maternal mortality rate of 984 deaths per 100,000 live births (13). Child health indicators are also concerning, with under-5 mortality at 133 per 1,000 live births (13). The main causes of death in children less than 5 years old are malaria, diarrheal disease, and acute respiratory infection (14). In recent national surveys, nearly 20% of children under 5 years old suffered an episode of diarrhea in the two weeks preceding the data collection, as reported by their caregiver (15).

Contaminated drinking water and poor hygiene contribute to these poor health indicators for new mothers and their children. Despite large investments in the water supply sector by the Government of Malawi, donors, and NGOs, access to safe drinking water is still a problem due to frequent equipment breakdowns, inappropriate technologies, unavailability of spare parts, and lack of trained water committees to maintain and repair the systems. In addition, drinking water that is not delivered under constant pressure directly to household taps is usually contaminated during transport to the home or during storage in the home. Hygiene behaviors are also suboptimal in Malawi—in a recent survey, two-thirds of respondents reported that they washed their hands after using the latrine and only about one-third before preparing meals (16).

### ***The Safe Water System in Malawi***

In November 2002, Population Services International (PSI), a social marketing non-governmental organization (NGO), initiated an SWS program in Malawi to prevent diarrheal illness among children under 5 years old. The SWS was promoted through media channels including radio announcements, signs painted on minibuses, billboards, signs, and flyers. The

disinfectant solution (locally-produced dilute sodium hypochlorite) was given the brand name *WaterGuard* and a price of 10 Kwacha (approximately \$US 0.08) for a 200-ml bottle sufficient to treat one family's stored drinking water for 1 month. *WaterGuard* was sold at supermarkets, pharmacies and by street vendors in rural areas. Despite the low price, a recent survey of over 1,600 women in Malawi showed that while nearly two-thirds of mothers had heard of *WaterGuard*, usage among these mothers remained low at 12%, or 7% of the total survey population (17). Thus, efforts need to be made to increase *WaterGuard* use in order to achieve the desired impact on diarrheal illness.

### ***UNICEF's Water, Sanitation, and Hygiene Basic Needs Package***

UNICEF supports the delivery of a low-cost "Water, Sanitation and Hygiene Basic Needs package" (WBN) that includes low-cost products for household treatment of drinking water. In Malawi, these kits contain one bottle of *WaterGuard*, one 20-liter bucket with a lid, one 10-liter hand washing bucket, one ladle, two packets of oral rehydration salts (ORS), and one 500 gram bar of soap. UNICEF/Malawi distributed 20,000 of these kits and hygiene messages in 22 districts in 2005 to a carefully targeted population of households headed by women or children, orphans, and those suffering from chronic illness. There are no data on the impact of the distribution of these kits in Malawi to date.

### ***Hygiene Promotion for Diarrheal Disease Prevention in Malawi***

One potential strategy to increase *WaterGuard* use would be to identify programs that provide services to pregnant and postnatal women and use them as platforms to introduce and expand the coverage of proven, effective health interventions. This strategy was shown to be effective in a prior initiative implemented by PSI Afghanistan, in which a clinic-based household

water treatment and hygiene promotion program targeting pregnant women resulted in significant improvement in knowledge of causes of diarrhea and hand washing practices (18).

To assess whether a similar approach might work in Malawi, the United States Agency for International Development (USAID) sponsored a pilot program in 2007 in collaboration with UNICEF, the Government of Malawi Ministry of Health (MOH), and PSI, to test the feasibility of promoting hygiene improvement interventions (specifically disinfection and safe storage of water at the point-of-use, and hand washing with soap) through Malawi's preventive health care system for pregnant women and their families, as part of the Government of Malawi's (GOM) Accelerated Community Integrated Management of Childhood Illnesses (C-IMCI). The purpose of this program was to improve maternal health and decrease diarrheal diseases in two districts in Malawi. The WBN kits, which included a water storage container with a tap, a bottle of *WaterGuard*, a 500 gram bar of soap, and 2 sachets of ORS, were distributed as incentives for pregnant women to come to a hospital or clinic for antenatal care and delivery. In addition, the women received up to three free refills of *WaterGuard* and soap as incentives for follow-up antenatal and postnatal checkups.

CDC was asked to collaborate with the Ministry of Health and UNICEF to evaluate this program. The purpose of the evaluation was to assess the impact of the antenatal program on water treatment practices and hygiene among enrolled women in two districts in Malawi, and to assess whether enrolled women passed the educational messages to close relatives or friends with children under 5 years old.

## **Objectives**

The objectives of the evaluation were as follows:

- Conduct a baseline survey of pregnant women in 15 health facilities in Blantyre and Salima districts in Malawi as they were enrolled in the program to assess current water, sanitation, and hygiene behaviors.
- For each evaluation participant, conduct an interview with one female relative or friend who had a child less than 5 years old and lived in the same community, to assess current water, sanitation, and hygiene behaviors.
- Deliver free hygiene improvement products (e.g., products for disinfection of water at the point-of use and soap) and appropriate education to pregnant women through the antenatal program at participating clinics in the two districts.
- Determine the program's impact on knowledge and practices, rates of *WaterGuard* and ORS usage, and improved hand washing practices among pregnant women enrolled in the program (program participants) and their female relatives and friends with children less than 5 years old in these two districts.
- Describe factors that motivated and inhibited changes in knowledge and practices among program participants
- Determine the program's impact on frequency of antenatal clinic attendance, delivery at a health care facility, and postnatal checks among program participants.

## **Methods**

### ***Evaluation design***

The evaluation had two components. The first involved a baseline cross-sectional survey of pregnant women receiving care at the 15 selected antenatal clinics to determine their water, sanitation, and hygiene practices followed by a home visit to observe household water, sanitation, and hygiene facilities. This survey will hereafter be referred to as the antenatal clinic

survey. The intervention supplies and education were given to participants at their first antenatal clinic visit during the program period or during their subsequent follow-up home visit. Nine months later, a follow-up home visit was made to all evaluation participants to assess whether their practices had changed as a result of the program.

The second component was designed to assess whether water, sanitation, and hygiene messages received by the program participants had diffused to their relatives and friends. At the time of the baseline interview, program participants were asked to identify female relatives or friends with children under 5 years old who live in their communities, and evaluation personnel visited these women at their homes to conduct a baseline interview and observations of water, sanitation, and hygiene facilities. This survey will hereafter be referred to as the diffusion survey. At the time of the follow-up assessment of program participants, the identified relatives and friends were also visited for a follow-up assessment.

Health Surveillance Assistants (HSAs) from each selected antenatal clinic were used as enumerators for the baseline survey, and trained census workers were hired as enumerators for the follow-up survey. Enumerators were supervised by Environmental Health Officers (EHOs) based at the antenatal clinics of the program participants.

### ***Program location and sample selection***

For this program, UNICEF selected two districts— Blantyre and Salima— out of 8 priority districts in which it was working with the GOM for implementation of accelerated C-IMCI. UNICEF selected 8 antenatal clinics in Blantyre District and 7 in Salima District for program implementation. The program population included pregnant women attending one of these 15 participating antenatal clinics. To calculate sample size, we estimated 7% overall utilization of SWS at baseline based on a prior national survey (17) and assumed, based on prior experience

with SWS interventions (3), an increase in utilization of 100% (to 14% utilization) in response to the intervention, a confidence level of 95%, and power of 80%. The resulting sample size of 328 was increased by 20%, to 400, to account for loss to follow-up.

We enrolled approximately 400 pregnant women (237 from Blantyre District and 163 from Salima District) by selecting a weighted sample of pregnant women from each health facility proportional to the average monthly antenatal clinic attendance. In order to complete enrollment from each health facility in one week, we used the average weekly clinic attendance and the number of women to be sampled per health facility to calculate a sampling interval, which, for each health facility, was every third patient.

To assess the diffusion of the hygiene interventions into the communities of antenatal clinic survey participants, we conducted a diffusion survey for which we asked each participant to name three non-pregnant female relatives or friends of reproductive age with at least one child under 5 years old. For each antenatal clinic survey participant, we attempted to interview one relative or friend for the diffusion survey, to meet our enrollment goal of 400 women (237 from Blantyre District and 163 from Salima District).

### ***Enrollment procedures***

Antenatal clinic survey enrollment occurred from May 21 through June 4, 2007 in the 15 selected antenatal clinics in Blantyre and Salima Districts. Survey participation was offered only to pregnant women who attended the clinic seeking antenatal care during the baseline antenatal clinic survey period. During each antenatal clinic day at a health facility, we randomly selected one of the first three women enrolled in the antenatal hygiene improvement program to participate in the baseline antenatal clinic survey. We then systematically selected every third women enrolled thereafter to participate in the survey until we reached the desired number of

women for that health facility. If a woman declined to participate, the next woman in line in the waiting area was approached for participation.

Health facility personnel enrolled women who consented to participate in the study, provided them an identification card entitling them to receive the hygiene supplies, conducted the baseline interview, and explained that, within a week of the clinic interview, they would be visited in their homes for follow-up observations of household water, sanitation, and hygiene facilities. The baseline interview was conducted before the women received any program education in the clinic. Evaluation personnel also informed the antenatal clinic participants that they would receive a home visit approximately 9 months later for a follow-up interview.

Following the home visit to the antenatal clinic program participant, a visit was made to the homes of female relatives or friends identified by program participants. Women who consented to participate in the diffusion survey were enrolled at the time of the home visit, interviewed, and informed that they would be visited again in approximately 9 months for a follow-up interview. If a relative or friend declined to participate, did not meet selection criteria, or was not available, the next relative or friend whose name was provided was approached for participation until a relative or friend was found. If a relative or friend was not found after all three friends were approached for participation, the pregnant woman was requested to provide the names of three more friends or relatives. After six relatives or friends were approached for participation, no further attempts were made.

### ***Human subjects protection***

A CDC Human Subjects Research Officer ruled that, because this activity consisted of an evaluation of a proven public health practice, it was exempt from human subjects research

oversight. Nevertheless, informed consent was obtained from all survey participants. The risks faced by the survey participants were no greater than those ordinarily encountered in daily life. No personal identifiers were used in the database. Consent forms for program participants enrolled in the antenatal clinic survey and for relatives and friends enrolled in the diffusion survey were translated into Chichewa and back translated into English (Appendices A and B).

### ***Baseline data collection***

A baseline antenatal clinic survey was conducted as women were enrolled in the program. The baseline survey consisted of a standardized questionnaire administered in the clinic at the time of enrollment to obtain data on demographic and socioeconomic characteristics, antenatal care, water sources, and water storage, treatment, hygiene, and sanitation practices, and a home visit conducted within 7 days of the standardized questionnaire to make key observations regarding the water storage container, water treatment method, presence of soap, presence of hand washing station, and demonstration of hand washing procedure (Appendix C). Stored water was also tested for residual chlorine using the N, N-diethyl-p-phenylenediamine (DPD) method ([www.hach.com](http://www.hach.com)) as an objective measure of utilization of *WaterGuard*. These questionnaires were translated into Chichewa, field tested, and revised before the survey was initiated.

A baseline diffusion survey of program participants' non-pregnant relatives or friends of reproductive age with a child under 5 years old was conducted to get detailed household-level information on the prevailing water treatment, sanitation, and hygiene behaviors (Appendix C). As in the survey of program participants, key household observations were made and stored water was tested for residual chlorine using the DPD method.

### ***Distribution of intervention***

In preparation for the distribution of the WBN kits, health care providers received training about the program, water treatment, proper use of *WaterGuard*, and correct hygiene practices before enrollment of pregnant women began. This training was conducted by PSI and MOH in Blantyre on May 15 – 16, 2007, and in Salima on May 19 – 20, 2007. The providers were instructed to incorporate education about water treatment, hand washing at critical times using correct technique, and use of the WBN kits into their antenatal clinic activities.

PSI assembled the WBN kits, which contained a safe water storage container (a 20-liter bucket with a lid and a tap), a 500 gram bar of hand soap, a bottle of *WaterGuard*, and two packets of ORS (*Thanzi* brand). The kits were labeled with behavior change messages, one about proper use and storage of *WaterGuard* for water disinfection, and one with proper steps and times for hand washing. PSI developed, printed, and provided promotional and educational materials needed for the social marketing of WBN related hygiene behaviors and products, especially the *WaterGuard* and soap. These educational and behavior change materials were prepared in English and Chichewa by PSI. A brochure from the WBN kit is attached (Appendix D). PSI was responsible for keeping sufficient quantities of *WaterGuard* at identified commercial sales outlets and other points of sale serving the program area.

Antenatal hygiene improvement program participation was offered to all pregnant women who presented to the participating clinics seeking antenatal care during the program period. Program personnel enrolled women who consented to participate, provided them a WBN kit, and inserted an identification card into their antenatal record that entitled them to receive up to three refills of the hygiene supplies. The WBN kits were distributed free to pregnant women during their first antenatal clinic during the program period. For program participants who were also

enrolled in the antenatal clinic survey, the bottle of *WaterGuard*, bar of hand soap, and educational materials were removed from the WBN kit and were given during their subsequent home visit to assure that observations more closely reflected household conditions pre-enrollment.

The full WBN hygiene kits were given to program participants after education sessions in which the clinic staff delivered behavior change messages. Refills of bottles of *WaterGuard* and soap were given on the first antenatal visit after receipt of the WBN kits and at up to two other antenatal or postnatal visits, or at the time of delivery. Each program participant was entitled to receive one WBN kit and three refills of bottles of *WaterGuard* and bars of hand washing soap during the life of the program, along with accompanying hygiene promotion and behavior change messages. At the same time, PSI expanded social marketing and distribution of *WaterGuard* throughout the target communities.

### ***Ongoing program education and monitoring***

In order to monitor the program during the intervention period and increase opportunities for education of the program participants, each HSA at participating clinics was instructed to visit at least five women enrolled in the antenatal hygiene improvement program (which could include women enrolled in the antenatal clinic survey) per month to make home observations of the presence of *WaterGuard*, soap, and the water storage container, and to test stored drinking water for the presence of residual chlorine. During these home visits, the HSAs reinforced educational messages to the program participants. The District Environmental Health Officer in each district collected these data to help periodically assess program effectiveness during the intervention period.

### ***Follow-up evaluation***

The follow-up antenatal clinic survey took place in Blantyre from February 25 – March 3, 2008 and in Salima from March 10 – 15, 2008. This survey was conducted at the household level and included only women interviewed in the baseline survey. The interviewer administered a standardized follow-up questionnaire, which included observations of water storage containers and soap, and tested for the presence or absence of residual chlorine in stored water using the DPD method as an objective measure of adherence to water treatment recommendations (Appendix E). Mothers were also asked to demonstrate hand washing procedures to measure knowledge retention.

A follow-up diffusion survey of the female relatives or friends of program participants interviewed at baseline was also conducted to determine whether water treatment and improved hygiene practices diffused to program non-participants in program communities. The questionnaire was similar to the one used for program participants; questions specific to the antenatal clinic program were removed (Appendix E).

### ***Data analysis***

Data from baseline and follow-up surveys were entered into Microsoft Access 2003 and analyzed using SAS version 9.1 software. Baseline demographic and socioeconomic characteristics of the women enrolled in the antenatal clinic and diffusion surveys were summarized. Water sources; water storage, treatment, hygiene, and sanitation practices; baseline residual chlorine levels in stored water; and the ability of participants to demonstrate proper hand washing technique at baseline and follow-up were summarized and compared.

To compare baseline and follow-up data, statistical analysis was done using McNemars test for paired proportions. McNemars test was also used to compare antenatal clinic and diffusion survey data

at baseline and follow-up to determine whether program participants had a greater increase in SWS use and hand washing with soap compared with their relatives and friends. For women lost to follow-up, we assumed their responses were missing at random.

To classify survey respondents by socioeconomic status, we used principal component analysis methodology developed by the World Bank in which household assets were assigned values based on data from the 1992 Malawi Demographic and Health Survey and then summed to create an asset score for each household (19). Survey respondents were placed in socioeconomic quintiles based on the value of their asset score compared to the entire survey population.

### ***Health worker survey***

At the time of the follow-up antenatal clinic and diffusion surveys, we also surveyed all available nurses, clinical officers, EHOs, and HSAs involved program implementation. Surveys were self-administered in English and responses were anonymous. Nurses, EHOs, and clinic officers were asked about safe water and hygiene knowledge retention, level of program participation, assessment of the impact of the program, and suggestions for program improvement. The HSA survey included the same questions with additional questions regarding home visits. Data from these surveys were entered and summarized using Microsoft Excel 2003.

### ***Cost analysis***

To inform future scale-up of this pilot program, we conducted a cost analysis to determine the economic inputs necessary to result in SWS knowledge and use and improved hand hygiene. We solicited cost information from each of the key stakeholders responsible for program implementation: MOH, UNICEF, and PSI. MOH expenses included health care facility personnel time spent on the program's education components as reported in the health worker survey. UNICEF expenses included coordination costs of linking selected program health facilities to carry out program objectives. PSI

expenses included commodities (hygiene kits items and refills), product distribution, health care facility personnel training, and increased social marketing conducted in the targeted health facilities' catchment areas during the program period. For cost calculations, we assumed that all 15,000 kits were distributed, and each recipient received all three refills. We also assumed that each recipient had 4 additional household members. We summed program costs, divided them by the number of hygiene kit recipients to calculate program cost per kit recipient. We divided program cost per kit recipient by the total number of household members of kit recipients to calculate program cost per household member. To calculate program cost per successful project outcome, we divided total program costs by the number of participants demonstrating correct hand washing and by the number of household members protected by SWS use in the home.

## **Results**

### ***Study enrollment***

In Blantyre District, 231 pregnant women from 8 health facilities were enrolled in the baseline antenatal clinic survey and 230 relatives or friends in the baseline diffusion survey. One enrolled pregnant woman did not have a friend or relative meeting the diffusion survey inclusion criteria. Six pregnant women and their six relatives or friends were excluded because of poor data quality.

In Salima District, 158 pregnant women were enrolled from 7 health facilities in the baseline antenatal clinic survey and 156 relatives or friends in the baseline diffusion survey. The relatives and friends of 2 pregnant women did not meet inclusion criteria and were excluded from the baseline diffusion survey. Six pregnant women and three relatives or friends were excluded because of poor data quality.

During the follow-up survey, 49 (21%) pregnant women and 65 (28%) relatives or friends in Blantyre District, and 10 (6%) pregnant women and 19 (12%) relatives or friends in Salima District were lost to follow-up (Table 1). Reasons for loss to follow-up included moved away (89%), refused (3%), died (2%), or other (6%). An additional 27 (7%) relatives or friends were excluded from analysis because they became pregnant and received the intervention during the program period. Data from 182 pregnant women and 155 relatives or friends in Blantyre District and 148 pregnant women and 120 relatives or friends in Salima District were included in the follow-up survey analysis, for a total of 330 pregnant women and 275 relatives or friends.

### ***Demographic and socioeconomic characteristics***

At baseline, the median respondent age was 24 years (range 15 to 45). Program participants had a median of 1 child less than 5 years old [range 0 to 4 (Table 2)] at the time of enrollment. The 386 relatives or friends enrolled in the baseline diffusion survey had a median of 1 child (range 1 to 5). At the time of the follow-up interview, 97% of program participants enrolled in the antenatal clinic and 93% of relatives and friends had at least one child less than 5 years old in the household. Forty-three percent of respondents in Blantyre District and 93% from Salima District were from rural areas. There were no significant differences in demographic or socioeconomic characteristics between women enrolled in the antenatal clinic survey and relatives and friends enrolled in the diffusion survey.

Among 775 baseline survey respondents, 92% were married, 6% were single, 1% were separated, and 1% were widowed (Table 2). Among these respondents, 20% had no education, 47% attended some primary school, 13% completed primary school, and 21% attended higher than primary school; 65% reported being able to read. Among respondents' husbands, 9% had no education, 35% attended some primary school, 16% completed primary school, and 40%

attended higher than primary school; 88% of respondents' husbands were able to read. A higher proportion of Blantyre respondents and their husbands reported completing primary school and being able to read than Salima respondents.

When respondents' households from both Districts were divided evenly into five socioeconomic quintiles based on their asset scores, the median socioeconomic quintile was the second wealthiest quintile for Blantyre residents and the second poorest for Salima (Table 2). Thirty percent of Blantyre respondents and 5% of Salima respondents were in the wealthiest socioeconomic quintile; 11% of Blantyre respondents and 33% of Salima respondents were in the poorest quintile.

The 143 survey respondents lost to follow-up were significantly more likely than the rest of the evaluation population to live in urban areas, have attended primary school, be able to read, and be in the wealthier two quintiles; their husbands were also more likely to have completed primary school and be able to read.

### ***Program timeline and product distribution***

Hygiene kits were distributed from May to December 2007 (Figure 2). Distribution of refills of *WaterGuard* and soap began in June 2007 and was continuing in some health facilities at the time of the follow-up survey. By the time of the time of the follow-up survey, 14,496 hygiene kits and 18,770 refills had been distributed.

### ***Water source, handling, and treatment***

In Blantyre District, 93% of program participants at baseline and 87% at follow-up used an improved water source (home tap, public tap, protected borehole, protected spring, or protected well) as their primary source of drinking water (Table 3). In Salima District, 85% of program participants at baseline and 84% at follow-up used an improved water source. Nearly

all program participants at baseline (99%) and follow-up (100%) reported that they stored their drinking water (Table 4). In Blantyre District, buckets were observed to store drinking water in 78% of homes and clay pots were observed in 21% of homes, while in Salima District, buckets were observed to store drinking water in 24% of homes and clay pots were observed in 79% of homes. Nearly all program participants (93%) reported that their water storage container had a lid. At baseline, 97% of program participants reported scooping water out with a ladle, cup, or hand to remove drinking water from their water storage container; only 3% poured the water or used a tap.

At follow-up, all program participants (100%) reported that they stored their drinking water; the hygiene kit bucket was observed to store drinking water in 87% of homes in Blantyre District and 95% of homes in Salima District. Nearly all (97%) were observed to have a lid on their water storage container. Over half (52%) reported pouring or using a tap to remove drinking water [ $p < 0.0001$  (Table 4)].

Of 389 program participants, 86% reported at baseline that they protected their drinking water to make it safe (Table 4). Methods of protecting drinking water that involved water treatment included boiling (34%), *WaterGuard* (44%), and chlorine (13%); 36% reported using at least one method in the past 2 days. At follow-up, 99% reported that they protected their drinking water to make it safe ( $p < 0.0001$ ). Methods included boiling (16%), *WaterGuard* (91%), and chlorine (12%); 82% reported using at least one method in the past 2 days ( $p < 0.0001$ ).

### ***WaterGuard knowledge***

Among program participants, 97% in Blantyre District and 73% in Salima District had heard of *WaterGuard* at baseline (Table 4). Among participants who had heard of *WaterGuard*,

47% were able to correctly state that 2 to 4 caps of *WaterGuard* are required per pail of water (dose depends on size of container and turbidity of water), 47% were able to correctly identify the 30-minute wait time before drinking after treatment, and 29% were able to correctly identify both the dose and wait time.

At follow-up, 100% of Blantyre participants ( $p=0.01$ ) and 99% of Salima participants ( $p<0.0001$ ) had heard of *WaterGuard* (Table 4). Program participants reported hearing about *WaterGuard* from the health center (98%), radio (62%), HSA visiting the home (38%), friend or neighbor (29%), and community meeting (10%); 86% reported sharing information they heard about *WaterGuard* with a friend or family member (Table 5).

Nearly all participants (97%) reported that someone had taught them how to use *WaterGuard* (Table 5). Program participants reported the health care provider at the health facility (57%) and HSA visiting the home (37%) as the person or source that gave them the most confidence to treat their drinking water with *WaterGuard*. Among participants in both districts, 79% were able to correctly identify the dose ( $p<0.0001$ ), 77% were able to correctly identify the wait time ( $p<0.0001$ ), and 62% were able to correctly identify the dose and wait time [ $p<0.0001$  (Table 4)]. Ninety-five percent of participants reported knowing where to purchase *WaterGuard*, and 73% reported that the price was at least 20 kwacha (Table 5).

### ***WaterGuard use***

At baseline, 70% of program participants from Blantyre District and 44% from Salima District said that they had ever used *WaterGuard*; 24% and 15%, respectively, said they had used *WaterGuard* in the past 2 days (Table 4). Among program participants in both districts, *WaterGuard* bottles were observed in 7% of homes. Stored water samples from 9% of homes

had positive chlorine residuals. Both a *WaterGuard* bottle in the home and a positive chlorine residual from a stored water sample were observed in 2% of homes.

Among program participants who reported ever using *WaterGuard* at baseline, 61% obtained the product from a local village shop, 44% from a retail shop in a trading center, and 12% from a community health worker (Table 6). Among 321 participants who reported never using *WaterGuard* at baseline, the reasons included “can’t afford” it (58%), “don’t need” it (13%), “water is clean” (12%), “don’t like the smell” (10%), and “use chlorine” provided by MOH (6%).

At follow-up, 100% of program participants in both districts said that they had ever used *WaterGuard* ( $p<0.0001$ ); 57% of Blantyre participants ( $p<0.0001$ ) and 85% of Salima participants ( $p<0.0001$ ) said they had used *WaterGuard* in the past 2 days (Table 4).

*WaterGuard* bottles were observed in 65% of program participants’ homes ( $p<0.0001$ ). Stored water samples from 71% of program participants had positive chlorine residuals ( $p<0.0001$ ). At follow-up, 61% of homes had both a *WaterGuard* bottle in the home and a positive chlorine residual from a stored water sample ( $p<0.0001$ ).

At follow-up, 33% of participants reported obtaining *WaterGuard* from a local village shop, 17% from a retail shop in a trading center, and 87% from a community health worker or HSA (Table 6). Fifty-five percent of participants reported purchasing *WaterGuard* after receiving one or more free bottles; 35% purchased one bottle, 28% purchased two bottles, and 37% purchased three or more bottles. Thirty-two percent of participants exhibited purchase and use of *WaterGuard*, indicated by a bottle in the home, a positive chlorine residual from a stored water sample, and reported purchase of *WaterGuard* after receiving free bottles (Table 4). Assuming that the 2% of participants who had a *WaterGuard* bottle in the home and a positive

chlorine residual from a stored water at baseline also purchased that *WaterGuard*, a significantly greater percentage of participants exhibited *WaterGuard* purchase and use at follow-up than at baseline ( $p < 0.0001$ ).

Participants reported that they tended to use *WaterGuard* “every day” (63%), “during the rainy season” (50%), and “during cholera outbreaks” [13% (Table 6)]. Participant stated that they last used *WaterGuard* today (52%), yesterday (18%), this week (10%), this month (9%), and more than one month ago (9%). Among the 42 participants who reported not using *WaterGuard* in the last one month, 55% said they stopped using *WaterGuard* because they “can’t afford” it, 24% said they use chlorine (usually distributed by MOH), 14% said it was “not available,” and 5% said they “don’t like the smell.”

### ***Sanitation and hand hygiene***

At baseline, toilet facilities were observed in 92% of Blantyre participants’ homes and 75% of Salima participants’ homes (Table 7). At follow-up, toilet facilities were observed in 96% of Blantyre participants’ homes and 89% of Salima participants’ homes.

When asked at baseline about when they washed their hands, 84% of program participants said after using the toilet, 80% said before eating, 46% said before cooking, 27% said after a diaper change, and 43% said when their hands are dirty (Table 7). Soap was observed in 74% of homes at baseline (Table 4). When program participants were asked to demonstrate how they washed their hands at baseline, 27% used soap and 22% lathered their hands completely with soap.

When asked at follow-up about when they washed their hands, 87% said after using the toilet, 78% said before eating, 31% said before cooking, 66% said after a diaper change, and 28% said when their hands are dirty (Table 7). Soap was observed in 82% of homes at follow-up

[ $p=0.003$  (Table 4)]. When asked to demonstrate how they washed their hands, 73% used soap ( $p<0.0001$ ) and 68% lathered their hands completely with soap ( $p<0.0001$ ).

### ***Pregnancy indicators***

The 389 program participants enrolled in the baseline antenatal clinic survey were in their 3<sup>rd</sup> to 9<sup>th</sup> month of pregnancy [median 7 months (Table 8)]. Twenty-two percent of program participants interviewed in the follow-up antenatal clinic survey reported that their pregnancy had been their first. The number of antenatal clinic visits during this pregnancy recorded in the program participants' health care passbooks was one visit for 6%, two for 21%, three for 37%, four for 27%, and more than four for 8%. Ninety percent of program participants in Blantyre and 59% in Salima delivered in a health facility; 68% of participants in Blantyre and 37% of participants in Salima had documentation of a postnatal check in their health care passbook.

Ninety-five percent of the program participants' babies were born alive, and 94% were alive at the time of the follow-up interview (Table 9). The median baby's age was 7 months (range 2 to 10 months). Nearly all babies (91%) had been seen at least once by a health care provider. Among babies who had reached the appropriate age for the following childhood immunizations, 98% had received BCG vaccination, 98% received the first diphtheria-pertussis-tetanus (DPT) vaccination, 93% received the second DPT vaccination, 85% received the third DPT vaccination, 70% received oral polio vaccine (OPV) at birth, 97% received the first OPV after birth, 93% received the second OPV, and 83% received the third OPV. None of the babies had reached beyond the recommended age to complete measles vaccination. All babies were breastfed. The age at which babies were first given anything made with water was less than 1 month for 5%, 1 to 3 months for 10%, 3 to 6 months for 49%, or greater than 6 months for 25%; 12% of babies had not yet been given water.

### ***Program participation***

Three *WaterGuard* and soap refills were received by 45% of survey respondents, two refills by 33%, one refill by 16%, and no refills by 6% (Table 10). When asked which items in the hygiene kit they liked best, 45% of participants reported the water storage container, 44% reported *WaterGuard*, 6% reported soap, and 5% reported Thanzi ORS (Table 3). Nearly all participants (94%) reported using the hygiene kit water storage container to store drinking water, and use was verified by observation in 91% of homes. Nearly all participants (98%) heard about *WaterGuard* at the health facility; 19% heard about *WaterGuard* once, 31% twice, 21% three times, and 29% more than three times. Ninety-one percent of participants reported that *WaterGuard* was available at their local shop. Over 99% of participants reported using *WaterGuard* from the hygiene kit to treat their drinking water.

Ninety-one percent of program participants received at least one home visit by an HSA during the program period (Table 3). Among those who received a home visit, 21% received one visit, 16% two visits, 15% three visits, 13% four visits, and 25% more than four visits. The median number of home visits to participants was 1 (range 0 – 8) in Blantyre District and 5 (range 0 – 10) in Salima District. Among participants who had a home visit, nearly all (99%) reported that the HSA demonstrated *WaterGuard* use and hand washing during the visit.

### ***Analysis by health facility***

In all 15 selected health facilities where the program was implemented, a higher percentage of program participants that were able to correctly identify the correct dose and wait time for water treatment with *WaterGuard* at follow-up compared with baseline (Table 11). This difference was statistically significant in 9 (60%) health facilities. The percentage of households with both a *WaterGuard* bottle in the home and a positive chlorine residual from a stored water

sample increased among women attending all 15 health facilities, with a statistically significant difference seen for 14 (93%) facilities. The percentage of program participants' households exhibiting purchase and use of *WaterGuard* also increased in the 15 health facilities, with a statistically significant difference in 11 (73%) facilities. Finally, the percentage of program participants who lathered their hands completely with soap when asked to demonstrate how they washed their hands increased in all 15 health facilities, with a statistically significant difference in 14 (93%) facilities.

### ***Diffusion survey***

Of 386 relatives and friends, 81% reported at baseline that they protected their drinking water to make it safe; 25% reported using at least one method in the past 2 days (Table 12). At baseline, 94% of respondents in Blantyre District and 79% in Salima District had heard of *WaterGuard*. Among those who had heard of *WaterGuard*, 48% were able to correctly state that 2 to 4 caps of *WaterGuard* are required per pail of water, 47% were able to correctly identify the 30-minute wait time before drinking after treatment, and 27% were able to correctly identify both the dose and wait time.

At baseline, 66% of relatives and friends from Blantyre District and 47% from Salima District said that they had ever used *WaterGuard*; 16% and 10%, respectively, said they had used *WaterGuard* in the past 2 days. Among relatives and friends in both districts, *WaterGuard* bottles were observed in 6% of homes. Stored water samples from 9% of homes had positive chlorine residuals. A *WaterGuard* bottle and a positive chlorine residual from a stored water sample were found in 2% of homes. Soap was observed in 71% of homes at baseline. When asked to demonstrate how they washed their hands at baseline, 22% used soap and 18% lathered their hands completely with soap.

Of the 275 relatives and friends interviewed in the follow-up diffusion survey, 93% reported that they protected their drinking water to make it safe ( $p<0.0001$ ), and 69% reported using at least one method in the past 2 days ( $p<0.0001$ ). Nearly all relatives and friends (99%) had heard of *WaterGuard* at follow-up ( $p<0.0001$ ); 59% reported that they heard about *WaterGuard* from the participant enrolled in the antenatal clinic program and 67% reported sharing information about *WaterGuard* with a friend or family member. Of the relatives and friends who had heard of *WaterGuard*, 63% were able to correctly state that 2 to 4 caps of *WaterGuard* are required per pail of water ( $p<0.0001$ ), 65% were able to correctly identify the 30-minute wait time before drinking after treatment ( $p<0.0001$ ), and 48% were able to correctly identify both the dose and wait time ( $p<0.0001$ ).

At follow-up, 84% of relatives and friends said that they had ever used *WaterGuard* ( $p<0.0001$ ); 30% of respondents from Blantyre ( $p<0.0001$ ) and 53% from Salima ( $p<0.0001$ ) said they had used *WaterGuard* in the past 2 days. *WaterGuard* bottles were observed in 28% of relatives and friends homes ( $p<0.0001$ ). Stored water samples from 38% of relatives and friends had positive chlorine residuals ( $p<0.0001$ ). At follow-up, 25% of relatives' or friends' homes had both a *WaterGuard* bottle in the home and a positive chlorine residual from a stored water sample ( $p<0.0001$ ).

Seventy percent of relatives and friends said they purchased *WaterGuard* in the preceding 6 months; 23% exhibited purchase and use of *WaterGuard* (bottle observed in the home, positive chlorine residual in stored water, and reported purchase of *WaterGuard*). Assuming that the 2% of relatives and friends who had a *WaterGuard* bottle in the home and a positive chlorine residual from a stored water at baseline also purchased that *WaterGuard*, a significantly greater percentage exhibited a *WaterGuard* purchase and use at follow-up than at baseline ( $p<0.0001$ ).

Soap was observed in 76% of relatives' or friends' homes at follow-up ( $p=0.03$ ). When relatives or friends were asked to demonstrate how they washed their hands at follow-up, 66% used soap ( $p<0.0001$ ) and 60% lathered their hands completely with soap ( $p<0.0001$ ).

When comparing results from the antenatal clinic and diffusion surveys at baseline, there were no significant differences among program participants and their relatives and friends in key indicators for knowledge and use of SWS and hand hygiene practices. At follow-up, a significantly higher proportion of program participants were able to correctly identify both the dose and wait time for *WaterGuard* use ( $p=0.0009$ ), had both a *WaterGuard* bottle in the home and a positive chlorine residual from a stored water sample ( $p<0.0001$ ), and lathered their hands completely with soap when asked to demonstrate how they washed their hands ( $p=0.04$ ).

### ***Health worker survey***

Among health worker survey respondents, 190 (79%) were HSAs, 26 (11%) were nurses, 15 (6%) were EHOs, 5 (2%) were medical assistants, and 4 (2%) were clinical officers. Among HSAs, 79% reported incorporating safe water and hygiene information into patient teaching for antenatal women before the training sessions for the hygiene improvement program, and 97% reported currently incorporating these messages. Per antenatal clinic day, the median times spent by HSAs on patient education, program-related record keeping, and hygiene kit assembly were 15, 10, and 10, respectively. For home visits, HSAs worked in a median of 4 villages (range 1 to 20) and visited a median of 10 program participants per week (range 2 to 61). Nearly all HSAs said these home visits included demonstration of SWS use (97%), demonstration of correct hand washing (96%), information about where to purchase *WaterGuard* (98%), and information about the cost of *WaterGuard* (96%). Most HSAs reported that more training on safe water and hygiene (85%) and more support from the supervisor (83%) would help them complete more

home visits in which they incorporated teaching about safe water and hygiene. HSAs also made the following program requests: continuation of the program (47%), more training (26%), improved transportation (18%), and demonstration materials (13%).

Among the 52 remaining health workers (EHOs, nurses, clinical officers, and medical assistants), 89% reported incorporating safe water and hygiene information into patient teaching for pregnant women before the start of the hygiene improvement program and 97% reported currently incorporating these messages. The median times spent by these health workers on patient education, program-related record keeping, and hygiene kit assembly were 15, 5, and 10 minutes per clinic day, respectively. Respondents reported running out the following supplies, and having to wait for resupply, during the program: hygiene kits (48%), WaterGuard or soap refills (26%), program logbook pages (33%), and program identification cards for participants' passbooks (49%). Health workers reported that more training on safe water and hygiene (78%), more time with each patient (68%), and more support from the supervisor (57%) would help them incorporate teaching about safe water and hygiene into antenatal clinic education sessions.

### ***Cost analysis***

The total cost of implementing the program, which provided 15,000 hygiene kits and 45,000 soap and WaterGuard refills to women in the participating health districts, including commodities, advertising, salaries, and coordination expenses over a ten month period, was \$128,152. The total cost breakdown by category was 69% spent on commodities and their distribution, educational materials, and advertising; 20% on salaries paid to health facility and PSI staff for education; and 11% on coordination expenses (Figure 3). All MOH expenses were salary-related and all UNICEF's expenses were coordination-related. Of PSI's expenses, 77%

were related to commodities, 14% to salaries, and 9% to coordination activities. The total program cost per hygiene kit recipient was \$8.54.

At follow-up, 61% of program participants demonstrated confirmed *WaterGuard* use by evidence of a *WaterGuard* bottle in the home and residual chlorine in the water storage container. If we assume that this result extended across the entire project population and we take into account an average of 5 persons per household, then 45,750 persons (15,000 households x 5 persons per household x 0.61) benefited from confirmed household use of *WaterGuard* as a result of this program, giving a cost per beneficiary of \$2.80. Using a similar set of assumptions and the finding that 32% of program participants reported *WaterGuard* purchase and had confirmed use (i.e., residual chlorine in stored water) at follow-up, then 24,000 persons (15,000 households x 5 persons per household x 0.32) benefited from the desired outcome, for a program cost of \$5.34 per person.

Since 68% of program participants surveyed at follow-up correctly demonstrated hand washing with soap, we can expect, if the program motivated all hygiene kit recipients equally, 10,200 of 15,000 kit recipients would be able to demonstrate the correct procedure after the intervention, resulting in a program cost of \$12.56 per successful handwashing outcome. If we remove from the cost-benefit calculation the 22% of women who already demonstrated correct hand washing procedure at baseline, we would expect, if the program impacted all women equally, that 6,900 kit recipients who were unable to demonstrate correct hand washing at baseline would be able to do so after the intervention, resulting in a program cost of \$18.57 per successful transfer of handwashing knowledge.

## **Conclusions**

This evaluation demonstrated that Malawi's antenatal care system was a very effective platform for promoting key hygiene behaviors among mothers. Program participants exhibited statistically significant increases in knowledge about *WaterGuard*, reported *WaterGuard* use, and confirmed presence and use of *WaterGuard* in the home. Furthermore, nearly a third of participants reported purchasing and using *WaterGuard* after receiving their free bottles, suggesting that water treatment behaviors motivated by this program may be sustainable after the free products are distributed. Safe water storage practices also increased through the use of the storage containers distributed by the project. We observed statistically significant increases in hand washing knowledge and ability to demonstrate correct hand washing procedures among program participants. Improvements in water treatment and handwashing behaviors occurred consistently across the health facilities participating in the program. Since safe storage and treatment of water at the household level and hand washing with soap have been shown to each typically reduce the risk of diarrhea by approximately 30–40% (2), this program could be expected to reduce the risk of diarrhea in program communities.

Although significant increases in hygiene behaviors were seen in both districts, a higher percentage of program participants in Salima District, which is predominantly rural, demonstrated purchase and confirmed use of *WaterGuard* at follow-up than participants in Blantyre District, which is mainly urban, with a more educated and wealthier population. A previous nationwide study suggested that *WaterGuard* use in Malawi was higher in urban, more educated, and wealthier populations (17). Results of this project appeared to reverse the trend found in the nationwide survey, which is encouraging because the risk of adverse outcomes from diarrhea is highest among poor, uneducated, rural populations.

The reasons for the success of this project in motivating behavior change in the target population are unclear, but participants in Salima, did receive, on average, more HSA home visits than participants in Blantyre. This increased individual attention may have more successfully motivated behavior change. At least two previous studies have documented greater adoption of point-of-use water treatment behaviors in populations receiving one-on-one interventions in the home (20, 21). Another possible factor influencing program outcomes was the multiple levels of communication about the program. In addition to HSA home visits, sources of information about *WaterGuard* among program participants included health facilities, radio advertisements, friends or relatives, and community meetings. When asked about the person or source that gave them the most confidence to use *WaterGuard*, the majority of program participants named health care providers or HSAs, which is consistent with previous research suggesting that health facilities are effective venues for promoting water treatment and hygiene behavior changes, and that health care personnel are valuable agents of change (22). Finally, a high percentage of program participants also said that they taught friends and relatives about what they learned about hygiene in this project, which suggests that they were confident enough in the learned skills to teach them to others. Self-efficacy is an important precursor to sustained behavior change (20).

The evaluation also suggested program benefits in use of antenatal, delivery, and postnatal services. The 2004 Malawi Demographic and Health Survey (DHS) found that 79% of women in Blantyre and 46% in Salima delivered at a health facility (13) while in this evaluation, institutional deliveries were reported by 90% of respondents from Blantyre and 59% from Salima. Similarly, in the 2004 DHS, 45% of women in Blantyre and 25% in Salima had postnatal checks (13) while, in this evaluation, 68% of respondents from Blantyre and 37% from Salima had postnatal checks. We do not know whether there had been districtwide increases in use of these services between 2004 and 2008, but the trend toward increased services found in this

evaluation was desirable and likely would contribute to lower maternal and neonatal morbidity and mortality.

While baseline data for infant survival and vaccination coverage by health facility were not available for this evaluation, survival and vaccination coverage of program participants' infants compared favorably with district- and nationwide data collected previously. For example, in 2004, infant mortality was 90 per 1,000 live births in Blantyre District (91% survival) and 84 per 1,000 live births in Salima District [92% survival (13)]. Among children of program participants, survival to the time of the follow-up survey, which occurred when infants were, on average, 7 months old, was 93% in Blantyre and 95% in Salima. Vaccine coverage in Malawi reported in the 2004 DHS was 90% for BCG vaccine by 12 months of age, 76% for the third DPT, and 73% for the third OPV in 2004 (13). In this evaluation, 96% of infants from Blantyre and 94% from Salima, received BCG, 90% from Blantyre and 79% from Salima received the third DPT, and 89% from Blantyre and 76% from Salima received the third OPV.

Although this hygiene program did not specifically promote the creation of sanitation facilities, an increase was noted in the proportion of homes with latrines at follow-up compared with baseline, particularly in Salima District. There are two possible explanations for this finding. First, other programs promoting or subsidizing sanitation may have occurred during the project period. No programs of this nature were directly observed by the field team, however. Second, sanitation programs may have preceded this program and resulted in latrine construction by the local population over the 9-month evaluation period. The antenatal clinic program could serve as an effective platform for latrine construction; further exploration of this possibility is warranted.

This evaluation showed significant improvements in water treatment and hand washing practices among the friends and relatives of program participants, demonstrating diffusion of the intervention into the community among women with children under 5 years old who are at highest risk of diarrhea. Information about *WaterGuard* was easily disseminated among women in program communities, with 86% of program participants sharing information about *WaterGuard* with their friends and family members, and over two-thirds of friends and relatives also sharing information with friends and family members. Additionally, despite not receiving free water treatment and hygiene improvement products, nearly one-fourth of relatives and friends had purchased *WaterGuard* and demonstrated use at follow-up, suggesting that limited free distribution of the product did not suppress demand, but in fact may have increased it. These findings also suggest that pregnant mothers may themselves be effective agents of change of hygiene behaviors by modeling the desired behavior.

The cost analysis suggested that effective promotion of water treatment and hygiene behaviors through this platform had relatively low programmatic costs. The cost per desired outcome ranged from USD 2.80 per household member using treated water in the home to approximately USD 19.00 per successful transfer of knowledge of proper handwashing procedure. Perhaps of greatest significance was the finding that mothers could be motivated to purchase and use *WaterGuard* for a program cost of less than USD 6.00 per person. Studies of the persistence of these behaviors over time are needed to better assess actual costs per sustained program benefit. Studies of the health impact of this type of program would also be useful to permit a cost effectiveness analysis.

The follow-up survey suggested that the antenatal clinic program did not add a substantial time burden to health workers. When surveyed about ways to facilitate the inclusion of safe water and

hygiene messages into their regular job responsibilities, health workers cited increased training rather than reducing their work demands. The greatest hindrance to program implementation was running out of various program supplies. They also noted that having more time with the patients would facilitate communication with their clients.

This study had several important limitations. First, since women from more distant communities may be less likely to attend the antenatal clinic, the population enrolled in the antenatal clinics may not have been representative of the entire population served by the selected health facilities. Additionally, the program itself may have not reached all populations served by the selected facilities since the intervention was distributed in the health facility and not in any of the outreach clinics that are more accessible to women living in distant villages. Since HSAs are assigned to all communities served by each health facility, the utilization of HSAs for program education and implementation greatly assisted dissemination of the program even to distant areas. Future efforts should be made to assure that women from the most distant communities are reached by the program.

Second, participation in the evaluation may have influenced the performance of the participants through the Hawthorne effect, particularly because this was a panel survey, in which the same population was surveyed at baseline and follow-up. The potential for a Hawthorne effect was mitigated somewhat by the fact that the follow-up survey took place 9 months after the baseline and the follow-up visits were made on a surprise basis.

Third, a number of survey participants were lost to follow-up and it is not possible to know whether program outcomes in this group were comparable to those who remained in the study. The population lost to follow-up was wealthier, more educated, and more likely to be urban than the population involved in the follow-up evaluation. This group was probably more

likely to have had improved water treatment and hygiene practices at baseline. Improvements seen in water treatment and hand hygiene practices among wealthier, more educated, urban participants who remained in the evaluation suggest that the loss to follow-up of these women would not have significantly affected evaluation findings.

Fourth, because of limited resources, a large number of HSAs with varying survey experience were used to conduct interviews for the baseline survey while professional enumerators were hired for the follow-up survey. This arrangement could have resulted in information bias, but this possibility was mitigated by close supervision. In addition, the HSAs accompanied the hired enumerators during the follow-up survey in order to guide them to participants' houses and were thus present and could help ensure that data were accurate and consistent with what they knew of the villages and participants. Despite this potential problem, the direction of the major findings of the evaluation did not vary by district or health facility, which suggested that the findings were robust.

Finally, the baseline survey was conducted during the dry season while the follow-up survey was conducted during the rainy season. Although this seasonal variation may have affected water treatment behaviors, it is very unlikely that the behavior changes noted in the evaluation could be due to seasonal variation alone. First, the increases in both water treatment and handwashing practices were higher than expected. Second, while it is conceivable that a higher percentage of women may treat their water during the rainy season because of concern about disease risk and because of the distribution of stock chlorine solution by the MOH, use of *WaterGuard* found in the follow-up evaluation was far greater than was found in a previous study in Malawi (17) and also in other countries with similar programs. Third, the change in knowledge of proper handwashing procedure could only have come from the program. Finally,

improvements in both water treatment and hand hygiene behaviors were greater among program participants than their relatives and friends. If seasonal variation alone resulted in changed behaviors, the program participants and their relatives and friends would have been expected to be affected equally.

The significant improvements in water treatment, hand hygiene, and antenatal and postnatal care demonstrated in this program justify expansion of this program. Because the scope of this program was limited and perhaps not generalizable to other regions, a phased expansion with interim evaluations of impact would be prudent. Although program costs were relatively low, it would also be prudent to monitor costs to assure that they remain manageable. Economies of scale in an expansion could result in reduced costs of some program components. Evaluation of health impact would be useful and would permit a cost effectiveness analysis of the program. The potential of the antenatal clinic program to reduce morbidity and mortality from diarrheal diseases, improve peri-natal outcomes, and influence friends and relatives of program participants to change their hygiene behaviors warrants further investigation of its place in Ministry of Health programs.

## **Recommendations**

### ***Program recommendations***

- The success of this program warrants continuation in Blantyre and Salima Districts, and expansion to other districts in Malawi with interim evaluation, particularly in rural areas where baseline SWS use was lowest and the follow-up use was highest.
- Future program expansion should include education of program participants by nurses in the health facilities and HSAs during home visits

- HSAs should conduct program monitoring during home visits to determine program impact and provide feedback to program participants.
- Consider how to best incorporate these duties into the job responsibilities of nurses, HSAs, and EHOs:
  - Determine protocol for HSA home visits, including the recommended number of visits per household, the educational messages provided during those visits, and the optimal time of those visits.
  - Provide additional safe water and hygiene training to health facility staff, including HSAs, and include provision of demonstration materials in program budget and planning.
- Future program expansion should consider how to incorporate implementation through outreach clinics in order to reach more distant populations.
- Consider modification of hygiene kit contents to decrease cost and facilitate distribution to more distant areas.
- To more efficiently incorporate improved water storage containers in expanded project, several modifications will be needed:
  - Taps for water storage containers should be locally-produced
  - Improved storage containers should be made available on local market for wider availability and to reduce unit costs
  - Hygiene instructions should be silk-screened on surface
- Improve supply chain to clinics to avoid stock-outs of key program supplies.
- In order to target mothers during their child's period of greatest susceptibility to diarrheal diseases, reach more rural communities, and provide mothers several additional

opportunities to develop the habit of water treatment and handwashing, initiate a pilot program for promotion of key hygiene behaviors through the expanded program in immunizations (EPI)

- Share program evaluation results with other agencies and governments working to improve water treatment, hygiene, and sanitation in other countries with similar use of antenatal services that also may benefit from such a program

### ***Research and evaluation recommendations***

- Conduct stratified analysis to determine the impact of demographics, socioeconomic characteristics, antenatal clinic attendance, HSA home visits, refills obtained, and other factors on the adoption of SWS and hand hygiene practices during the program period.
- Compare data on antenatal attendance, delivery at a health facility, and postnatal visits from program participants with data from the same time period from other health facilities in the same districts that were not involved in the program to determine whether increased use of these services can be attributed to this program.
- Investigate reasons for the increased percentage of homes with sanitation facilities demonstrated by this program evaluation and determine whether this program, or other programs using health care facility platforms, can also promote sanitation.
- Conduct an evaluation to determine whether the EPI program is also an effective health-facility-based platform for promoting key hygiene behaviors, and whether providing additional refills during childhood immunizations can demonstrate or augment the water treatment and hygiene behavior changes observed with the antenatal clinic platform alone.

- If program scale-up is planned, conduct an interim evaluation using similar methodology to help guide future scale-up.
- During either the evaluation of the EPI program or during evaluation of future antenatal clinic program scale-up efforts, consider re-evaluating the communities involved in this pilot program to determine whether behavior changes were sustained over time.
- Conduct future evaluations using a population-based survey methodology to obtain more representative data.
- Attempt to obtain resources to conduct health impact evaluation.
- If large-scale implementation is performed, monitor past, present, and future infant mortality data to obtain ecologic data on program impact.

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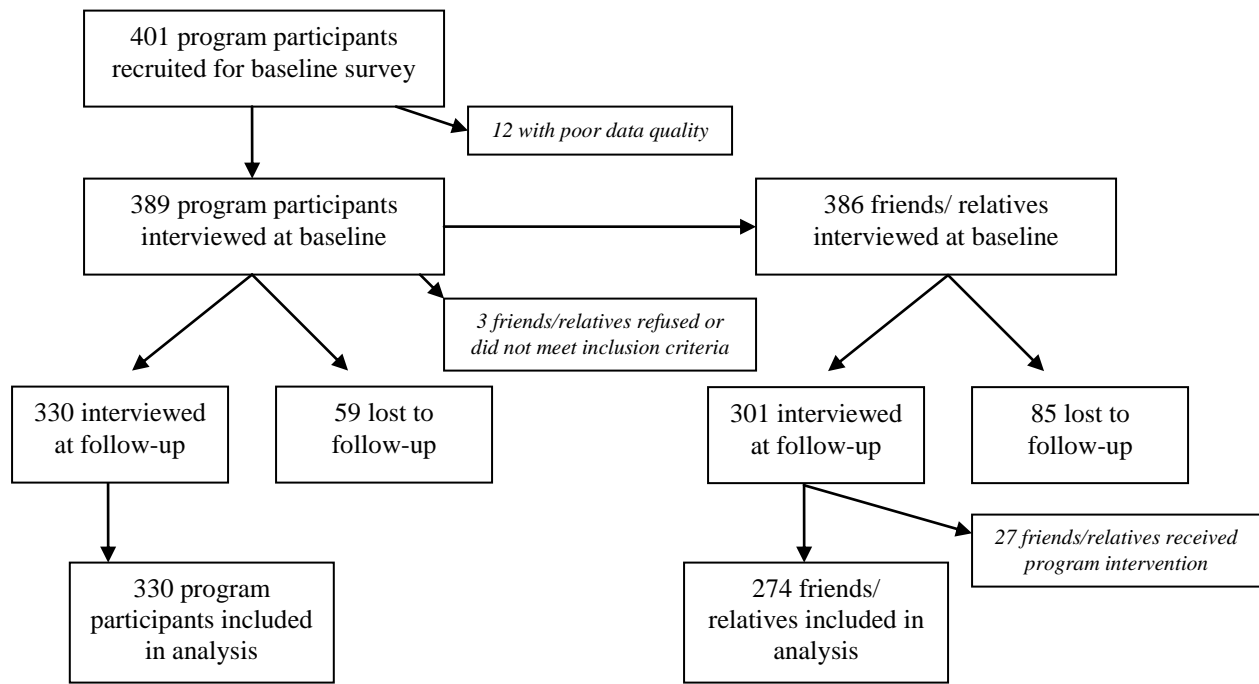
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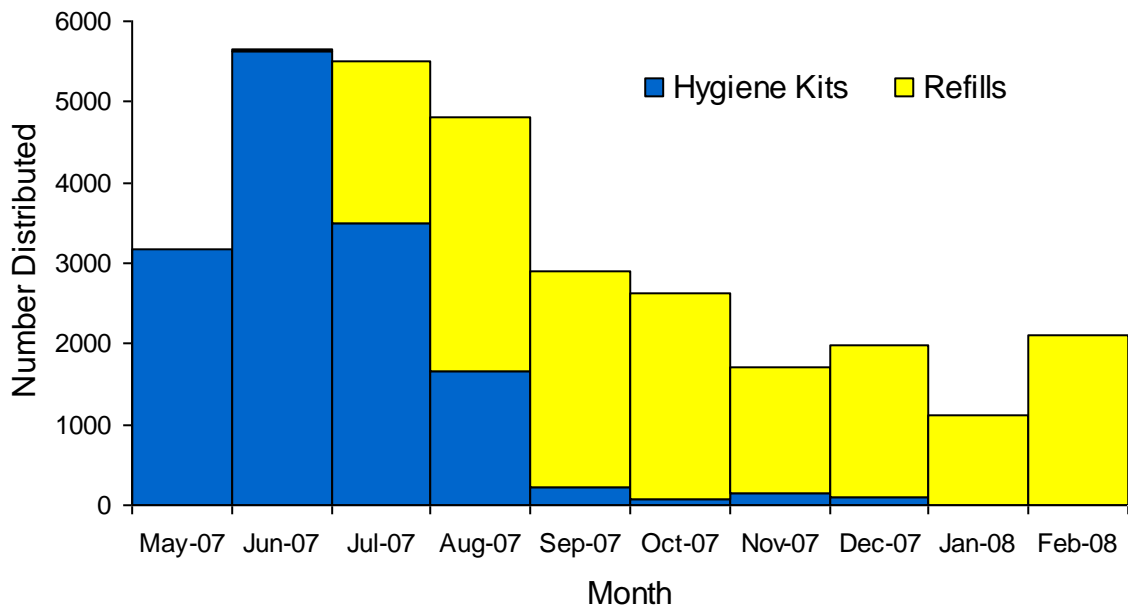
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**Figure 1. Baseline and follow-up survey enrollment, Blantyre and Salima Districts**



**Figure 2. Hygiene kit and refill distribution by month during program intervention period, Blantyre and Salima Districts, May 2007–February 2008**



**Table 1. Follow-up survey enrollment, Blantyre and Salima Districts, February–March 2008**

<b>Characteristic (%)</b>	<b>BLANTYRE DISTRICT</b>			<b>SALIMA DISTRICT</b>			<b>TOTAL</b>		
	<b>Pregnant women (N*=231)</b>	<b>Friends/relatives (N=230)</b>	<b>Total (N=461)</b>	<b>Pregnant women (N=158)</b>	<b>Friends/relatives (N=156)</b>	<b>Total (N=314)</b>	<b>Pregnant women (N=389)</b>	<b>Friends/relatives (N=386)</b>	<b>Total (N=775)</b>
Enrolled in follow-up survey	182 (79)	155 (67)	337 (73)	148 (94)	120 (77)	268 (85)	330 (85)	275 (71)	605 (78)
Excluded from follow-up survey	49 (21)	75 (33)	124 (27)	10 (6)	36 (23)	46 (15)	59 (15)	111 (29)	170 (22)
Lost to follow-up	49 (21)	65 (28)	114 (25)	10 (6)	19 (12)	29 (9)	59 (15)	84 (22)	143 (18)
Moved away	44 (90)	60 (92)	104 (91)	9 (90)	14 (74)	23 (79)	53 (90)	74 (88)	127 (89)
Refused	2 (4)	2 (3)	4 (3)	0	1 (5)	1 (3)	2 (3)	3 (4)	5 (3)
Other	2 (4)	3 (5)	5 (4)	0	3 (16)	3 (10)	2 (3)	6 (7)	8 (6)
Died	1 (2)	0	1 (1)	1 (10)	1 (5)	2 (7)	2 (3)	1 (1)	3 (2)
Friend who received hygiene kit	n/a	10 (4)	n/a	n/a	17 (11)	n/a	n/a	27 (7)	n/a

**Table 2. Demographic characteristics of baseline survey respondents, Blantyre and Salima Districts, May-June 2007**

Characteristic (%)	BLANTYRE DISTRICT			SALIMA DISTRICT			TOTAL		
	Pregnant women (N*=231)	Friends/relatives (N*=230)	Total (N*=461)	Pregnant women (N*=158)	Friends/relatives (N*=156)	Total (N*=314)	Pregnant women (N*=389)	Friends/relatives (N*=386)	Total (N*=775)
Median age (range)	23 (15-41)	25 (16-42)	24 (15-42)	24 (16-45)	25 (16-45)	25 (16-45)	23 (15-45)	25 (16-45)	24 (15-45)
Median household size (range)	4 (1-10)	4 (2-11)	4 (1-11)	4 (2-9)	5 (2-15)	4 (2-15)	4 (1-10)	4 (2-15)	4 (1-15)
Median no. children < 5 yrs at enrollment (range)	1 (0-4)	1 (1-5)	1 (0-5)	1 (0-3)	1 (1-3)	1 (0-3)	1 (0-4)	1 (1-5)	1 (0-5)
Children < 5 in household at follow-up	173 (95)	141 (92)	314 (94)	146 (99)	113 (94)	259 (97)	319 (97)	254 (93)	573 (95)
Village									
Rural	107 (46)	106 (46)	213 (46)	147 (93)	145 (93)	284 (93)	254 (65)	251 (65)	505 (65)
Urban	124 (54)	124 (54)	248 (54)	11 (7)	11 (7)	22 (7)	135 (35)	135 (35)	270 (35)
Marital status									
Married	216 (94)	206 (90)	422 (92)	155 (98)	135 (88)	290 (93)	371 (95)	341 (89)	712 (92)
Single	12 (5)	15 (7)	27 (6)	3 (2)	14 (9)	15 (5)	15 (4)	29 (8)	44 (6)
Separated	3 (1)	3 (1)	6 (1)	0	4 (3)	4 (1)	3 (1)	7 (2)	10 (1)
Widowed	0	6 (3)	6 (1)	0	1 (<1)	1 (<1)	0 (0)	7 (2)	7 (1)
Education									
None	18 (8)	26 (11)	44 (10)	55 (35)	53 (34)	108 (35)	73 (19)	79 (21)	152 (20)
Some primary school	112 (49)	95 (41)	207 (45)	79 (50)	78 (50)	157 (50)	191 (49)	173 (45)	364 (47)
Completed primary school	36 (16)	37 (16)	73 (16)	13 (8)	11 (7)	24 (8)	49 (13)	48 (12)	97 (13)
More than primary school	63 (28)	72 (31)	135 (29)	11 (7)	13 (8)	24 (8)	74 (19)	85 (22)	159 (21)
Able to read	178 (78)	177 (77)	355 (78)	70 (44)	78 (50)	148 (47)	248 (64)	255 (66)	503 (65)
Husband's education									
None	7 (3)	12 (6)	19 (5)	18 (13)	24 (20)	42 (16)	25 (7)	36 (11)	61 (9)
Some primary school	52 (26)	45 (23)	97 (24)	80 (57)	52 (42)	132 (50)	132 (38)	97 (30)	229 (35)
Completed primary school	37 (18)	34 (17)	71 (18)	13 (9)	21 (17)	34 (13)	50 (15)	55 (17)	105 (16)
More than primary school	106 (52)	106 (54)	212 (53)	30 (21)	26 (21)	56 (21)	136 (40)	132 (41)	268 (40)
Able to read	202 (94)	192 (94)	394 (94)	125 (83)	101 (76)	226 (80)	327 (90)	293 (87)	620 (88)
Wealth quintile among survey population									
Richest	65 (30)	66 (30)	131 (30)	10 (7)	6 (4)	16 (5)	75 (20)	72 (20)	147 (20)
Second	66 (30)	66 (30)	132 (30)	7 (5)	8 (5)	15 (5)	73 (20)	74 (20)	147 (20)
Third	37 (17)	32 (15)	69 (16)	49 (32)	34 (23)	83 (28)	86 (23)	66 (18)	152 (21)
Fourth	27 (12)	29 (13)	56 (13)	42 (28)	45 (30)	87 (29)	69 (19)	74 (20)	143 (19)
Poorest	24 (10)	26 (12)	50 (11)	43 (28)	55 (37)	98 (33)	67 (18)	81 (22)	148 (20)

\*For some items, N may vary by small numbers

**Table 3. Water source, storage, and treatment among program participants at baseline (May – June 2007) and follow-up (February – March 2008), Blantyre and Salima Districts**

Characteristic (%)	BLANTYRE		SALIMA		TOTAL	
	Baseline (N*=231)	Follow-up (N*=182)	Baseline (N*=158)	Follow-up (N*=148)	Baseline (N*=389)	Follow-up (N*=330)
Primary water source						
Improved	213 (93)	159 (87)	133 (85)	125 (84)	346 (90)	284 (86)
Unimproved	15 (7)	23 (13)	24 (15)	23 (16)	39 (10)	46 (14)
Stores drinking water	231 (100)	182 (100)	155 (98)	148 (100)	386 (99)	330 (100)
Observed water storage container(s)						
Hygiene kit bucket	5 (2)	158 (87)	0	141 (95)	5 (1)	299 (91)
Other bucket	180 (78)	30 (16)	35 (24)	12 (8)	215 (57)	42 (13)
Clay pot	49 (21)	13 (7)	116 (79)	28 (19)	165 (44)	41 (12)
Jerry can	19 (8)	4 (2)	1 (1)	1 (1)	20 (5)	5 (2)
Plastic bottles	7 (3)	5 (3)	4 (3)	1 (1)	11 (3)	6 (2)
Water tank/ barrel/ drum	1 (<1)	6 (3)	0	9 (6)	1 (<1)	15 (5)
Basin	4 (2)	0	0	0	4 (1)	0
Storage container with lid	218 (94)	175 (96)	141 (92)	146 (99)	359 (93)	321 (97)
Method of removing drinking water						
Scoop	220 (96)	102 (56)	155 (100)	58 (39)	375 (97)	160 (48)
Pour	9 (4)	2 (1)	0	0	9 (2)	2 (1)
Tap	1 (<1)	78 (43)	0	90 (61)	1 (<1)	168 (51)
Protects drinking water	205 (89)	180 (99)	130 (82)	148 (100)	335 (86)	328 (99)
Method of protecting drinking water						
Boil	86 (37)	32 (18)	48 (30)	22 (15)	134 (34)	54 (16)
Filter	17 (7)	2 (1)	15 (9)	9 (6)	32 (8)	11 (3)
Let settle	15 (6)	0	10 (6)	5 (3)	25 (6)	5 (2)
Treat with <i>WaterGuard</i>	124 (54)	158 (88)	46 (29)	141 (95)	170 (44)	299 (91)
Treat with <i>WaterGuard wa ufa</i>	10 (4)	0	5 (3)	1 (1)	15 (4)	1 (<1)
Treat with chlorine	22 (10)	25 (14)	20 (13)	13 (9)	49 (13)	38 (12)
Use any of the above in past 2 days	81 (36)	120 (74)	38 (25)	132 (92)	136 (36)	252 (82)

\*For some items, N may vary by small numbers

**Table 4. *WaterGuard* knowledge, use, and hand hygiene practices among program participants at baseline (May – June 2007) and follow-up (February – March 2008), Blantyre and Salima Districts**

Characteristic (%)	BLANTYRE			SALIMA			TOTAL		
	Baseline (N*=231)	Follow-up (N*=182)	p-value	Baseline (N*=158)	Follow-up (N*=148)	p-value	Baseline (N*=389)	Follow-up (N*=330)	p-value
Pours or uses tap to remove drinking water	10 (4)	80 (44)	<0.0001	0	90 (61)	<0.0001	10 (3)	170 (52)	<0.0001
Protects drinking water to make it safe	205 (89)	180 (99)	<0.0001	130 (82)	148 (100)	<0.0001	335 (86)	328 (99)	<0.0001
Use any method to protect water in past 2 days	81 (36)	120 (74)	<0.0001	55 (35)	132 (92)	<0.0001	136 (36)	252 (82)	<0.0001
Heard of <i>WaterGuard</i>	224 (97)	182 (100)	0.01	115 (73)	147 (99)	<0.0001	339 (87)	329 (>99)	<0.0001
Knows how to use <i>WaterGuard</i>									
2-4 caps per 20 liters	111 (50)	141 (77)	<0.0001	50 (43)	119 (81)	<0.0001	161 (47)	260 (79)	<0.0001
Wait ≥ 30 minutes before drinking	110 (49)	136 (75)	<0.0001	50 (43)	117 (80)	<0.0001	160 (47)	253 (77)	<0.0001
Knows both of the above	71 (32)	109 (60)	<0.0001	26 (23)	95 (65)	<0.0001	97 (29)	206 (62)	<0.0001
<i>WaterGuard</i> use									
Ever used <i>WaterGuard</i>	161 (70)	182 (100)	<0.0001	69 (44)	148 (100)	<0.0001	230 (59)	330 (100)	<0.0001
Treated with <i>WaterGuard</i> in last 2 days	54 (24)	102 (57)	<0.0001	24 (15)	125 (85)	<0.0001	78 (20)	227 (70)	<0.0001
<i>WaterGuard</i> bottle observed in home	18 (8)	93 (51)	<0.0001	11 (7)	122 (82)	<0.0001	19 (7)	215 (65)	<0.0001
Positive chlorine (cl) test	27 (12)	98 (57)	<0.0001	7 (5)	125 (86)	<0.0001	34 (9)	223 (71)	<0.0001
Positive cl test and <i>WaterGuard</i> observed	4 (2)	76 (44)	<0.0001	2 (1)	118 (81)	<0.0001	6 (2)	194 (61)	<0.0001
Purchased <i>WG</i> , positive cl test, <i>WG</i> observed	4 (2)	45 (27)	<0.0001	2 (1)	55 (39)	<0.0001	6 (2)	100 (32)	<0.0001
Soap observed in home	179 (78)	154 (85)	0.07	105 (68)	116 (78)	0.02	284 (74)	270 (82)	0.003
Hand washing demonstration									
Uses soap	62 (27)	132 (73)	<0.0001	40 (27)	110 (74)	<0.0001	102 (27)	242 (73)	<0.0001
Lathers hands completely with soap	49 (21)	117 (64)	<0.0001	34 (23)	107 (72)	<0.0001	83 (22)	224 (68)	<0.0001

\*For some items, N may vary by small numbers

**Table 5. *WaterGuard* information sources among program participants and their relatives and friends at follow-up, Blantyre and Salima Districts, February – March 2008**

Characteristic (%)	BLANTYRE		SALIMA		TOTAL	
	Pregnant women (N*=182)	Friends/relatives (N*=155)	Pregnant women (N*=148)	Friends/relatives (N*=120)	Pregnant women (N*=330)	Friends/relatives (N*=275)
<i>Where heard about WaterGuard</i>						
Health centre	178 (98)	44 (29)	145 (99)	41 (35)	323 (98)	85 (31)
Radio	113 (62)	115 (75)	92 (63)	79 (67)	205 (62)	194 (72)
Television	3 (2)	2 (1)	1 (1)	0	4 (1)	2 (1)
Newspaper	1 (1)	3 (2)	0	2 (2)	1 (<1)	5 (2)
Billboard	2 (1)	7 (5)	1 (1)	2 (2)	3 (1)	9 (3)
Flyer or brochure	3 (2)	6 (4)	2 (1)	1 (1)	5 (2)	7 (3)
HSA visiting home	45 (25)	42 (27)	81 (55)	50 (42)	126 (38)	91 (34)
Community meeting	23 (13)	13 (9)	11 (7)	9 (8)	34 (10)	22 (8)
Village leader	9 (5)	9 (6)	6 (4)	4 (3)	15 (5)	13 (5)
Friend/ neighbor/ relative	49 (27)	38 (25)	44 (30)	34 (29)	93 (28)	72 (27)
Local shop (in the villages)	8 (4)	13 (9)	17 (12)	17 (14)	25 (8)	30 (11)
No other place	28 (15)	n/a	9 (6)	n/a	37 (11)	n/a
<i>Share information about WaterGuard</i>						
	146 (82)	98 (66)	135 (92)	77 (68)	281 (86)	175 (67)
<i>Someone taught to use WaterGuard</i>						
	174 (96)	117 (76)	146 (99)	93 (79)	320 (97)	210 (78)
<i>Gave you confidence to treat with WaterGuard</i>						
Health care provider in health facility	108 (64)	59 (49)	76 (52)	36 (38)	184 (57)	95 (44)
HSA visiting home	48 (29)	36 (30)	67 (46)	46 (48)	115 (37)	82 (38)
Friend/ neighbor/ relative	2 (1)	16 (13)	1 (1)	12 (13)	3 (1)	28 (13)
Shop owner	0	1 (1)	0	1 (1)	0	2 (1)
Radio advertisement	3 (2)	4 (3)	0	0	3 (1)	4 (2)
Brochure	1 (1)	1 (1)	0	0	1 (<1)	1 (<1)
None	5 (3)	2 (2)	2 (1)	1 (1)	7 (2)	3 (1)
<i>Knows where to buy WaterGuard</i>						
	177 (97)	149 (97)	136 (93)	104 (88)	313 (95)	253 (93)
<i>Knows price</i>						
	130 (71)	107 (69)	112 (76)	75 (63)	242 (73)	182 (66)

\*For some items, N may vary by small numbers

**Table 6. *WaterGuard* use behaviors among program participants and their relatives and friends at follow-up, Blantyre and Salima Districts, February – March 2008**

Characteristic (%)	BLANTYRE		SALIMA		TOTAL	
	Pregnant women (N*=182)	Friends/relatives (N*=155)	Pregnant women (N*=148)	Friends/relatives (N*=120)	Pregnant women (N*=330)	Friends/relatives (N*=275)
How <i>WaterGuard</i> is obtained						
Community health worker or HC staff	23 (14)	148 (83)	5 (7)	136 (93)	28 (12)	284 (87)
Friend/relative	2 (1)	4 (2)	0	1 (1)	2 (1)	5 (2)
Local shop	103 (64)	56 (31)	37 (54)	52 (35)	140 (61)	108 (33)
Retail shop	68 (43)	39 (22)	33 (48)	17 (12)	101 (44)	56 (17)
Purchased <i>WaterGuard</i>	110 (62)	108 (70)	68 (47)	85 (71)	178 (55)	193 (70)
One	30 (27)	26 (24)	32 (47)	15 (18)	62 (35)	41 (21)
Two	32 (29)	27 (25)	19 (28)	15 (18)	51 (28)	42 (22)
More than two	49 (44)	55 (51)	17 (25)	54 (64)	66 (37)	109 (57)
More likely to use <i>WaterGuard</i>						
Every day	107 (60)	61 (47)	99 (67)	58 (56)	206 (63)	119 (51)
Special occasions	5 (3)	4 (3)	4 (3)	0	9 (3)	4 (2)
For guests or visitors	0	0	0	0	0	0
During rainy season	91 (51)	74 (57)	71 (48)	66 (63)	162 (50)	140 (60)
During cholera outbreaks	26 (15)	25 (19)	15 (10)	18 (17)	41 (13)	43 (18)
Last used <i>WaterGuard</i>						
Today	64 (36)	24 (19)	104 (71)	43 (41)	168 (52)	67 (29)
Yesterday	38 (22)	22 (17)	21 (14)	20 (19)	59 (18)	42 (18)
This week	20 (11)	17 (13)	12 (8)	9 (9)	32 (10)	26 (11)
More than one week but this month	24 (14)	32 (25)	6 (4)	8 (8)	30 (9)	40 (17)
More than one month	26 (14)	33 (26)	4 (3)	22 (21)	30 (9)	55 (24)
Don't know	4 (2)	0	0	2 (2)	4 (1)	2 (1)
Reasons for not using <i>WaterGuard</i>		(N=26)		(N=14)		(N=42)
Can't afford	n/a	9 (35)	n/a	9 (64)	n/a	18 (45)
Uses chlorine	n/a	7 (27)	n/a	4 (29)	n/a	11 (28)
Doesn't like smell or taste	n/a	5 (19)	n/a	0	n/a	5 (13)
Doesn't know how	n/a	3 (12)	n/a	2 (21)	n/a	6 (15)
Not available	n/a	2 (8)	n/a	0	n/a	2 (5)
Don't need	n/a	4 (15)	n/a	2 (14)	n/a	6 (15)
Other	n/a	9 (35)	n/a	1 (7)	n/a	10 (25)
Reasons for stopping <i>WaterGuard</i>		(N=44)		(N=24)		(N=68)
Can't afford	19 (51)	24 (55)	4 (80)	18 (75)	23 (55)	42 (62)
Uses chlorine	10 (27)	14 (32)	0	7 (29)	10 (24)	21 (31)
Doesn't like smell or taste	2 (5)	6 (14)	0	0	2 (5)	6 (9)
Doesn't know how	1 (3)	0	0	0	1 (2)	0
Not available	6 (16)	4 (9)	0	1 (4)	6 (14)	5 (7)
Don't need	0	1 (2)	0	1 (4)	0	2 (3)
Other	3 (8)	5 (11)	1 (20)	2 (8)	4 (10)	7 (10)

\*For some items, N may vary by small numbers

**Table 7. Sanitation, hand hygiene, and diarrhea treatment behaviors among program participants at baseline (May – June 2007) and follow-up (February – March 2008), Blantyre and Salima Districts**

<b>Characteristic (%)</b>	<b>BLANTYRE</b>		<b>SALIMA</b>		<b>TOTAL</b>	
	<b>Baseline (N*=231)</b>	<b>Follow-up (N*=182)</b>	<b>Baseline (N*=158)</b>	<b>Follow-up (N*=148)</b>	<b>Baseline (N*=389)</b>	<b>Follow-up (N*=330)</b>
Observed toilet facility						
Latrine present	211 (92)	174 (96)	118 (75)	131 (89)	329 (85)	305 (93)
No facility	19 (8)	8 (4)	39 (25)	16 (11)	58 (15)	24 (7)
When hands are washed						
After using toilet	208 (90)	159 (87)	117 (74)	125 (86)	325 (84)	284 (87)
Before eating	188 (81)	137 (75)	123 (78)	119 (82)	311 (80)	256 (78)
Before cooking	122 (53)	59 (32)	58 (37)	44 (30)	180 (46)	103 (31)
After diaper change	75 (32)	117 (64)	29 (18)	98 (67)	104 (27)	215 (66)
When they are dirty	109 (47)	53 (29)	60 (38)	38 (26)	169 (43)	91 (28)
Child<5 with diarrhea in last 2 wks						
Treated for diarrhea	19 (95)	40 (85)	17 (61)	28 (90)	36 (75)	68 (87)
Treated with ORS	17 (81)	38 (81)	14 (56)	25 (81)	31 (67)	63 (81)

\*For some items, N may vary by small numbers

**Table 8. Antenatal clinic attendance, delivery site, delivery assistant, pregnancy outcome, and postnatal checks among program participants at follow-up, Blantyre and Salima Districts, May 2007 – March 2008**

<b>Characteristic (%)</b>	<b>Blantyre (N*=182)</b>	<b>Salima (N*=148)</b>	<b>Total (N*=330)</b>
Median months gestation at enrollment (range)	7 (3 - 9)	6 (3 - 9)	7 (3 - 9)
First pregnancy	48 (26)	24 (16)	72 (22)
Visits to health facility during pregnancy			
1	8 (4)	8 (5)	16 (5)
2	25 (14)	24 (16)	49 (15)
3	64 (35)	52 (35)	116 (35)
4	57 (31)	44 (30)	101 (31)
5 or more	28 (15)	20 (14)	48 (15)
Median number antenatal visits (range)	3 (1 - 6)	3 (1 - 8)	3 (1 - 8)
1 visit	10 (7)	6 (5)	16 (6)
2 visit	31 (20)	27 (23)	58 (21)
3 visit	55 (36)	46 (39)	101 (37)
4 visit	45 (30)	29 (24)	74 (27)
>4 visits	11 (7)	11 (9)	22 (8)
Where delivered			
Home or neighbor's home	16 (9)	55 (37)	71 (22)
Clinic/hospital/health centre	162 (90)	88 (59)	250 (76)
On the way to the clinic	3 (2)	5 (3)	8 (2)
Who assisted			
Doctor/nurse/midwife	162 (90)	88 (59)	250 (76)
TBA	10 (6)	45 (30)	55 (17)
Relative/ friend	12 (7)	15 (10)	27 (8)
No one	0	1 (1)	1 (<1)
Postnatal check after delivery	113 (68)	50 (37)	163 (54)

\*For some items, N may vary by small numbers

**Table 9. Birth outcomes, infant immunizations received, feeding practices, and diarrhea treatment reported by program participants at follow-up, Blantyre and Salima Districts, May 2007 – March 2008**

<b>Characteristic (%)</b>	<b>Blantyre (N*=182)</b>	<b>Salima (N*=148)</b>	<b>Total (N*=330)</b>
Infant alive at birth	150 (94)	119 (96)	269 (95)
Baby still alive	170 (93)	140 (95)	310 (94)
Median baby age in months (range)	7 (2 - 10)	7 (2 - 10)	7 (2 - 10)
Baby seen by health care provider	151 (89)	131 (94)	282 (91)
BCG	160 (96)	135 (99)	295 (98)
DPT1	164 (99)	132 (97)	296 (98)
DPT2	160 (96)	121 (89)	281 (93)
DPT3	140 (90)	103 (79)	143 (85)
OPV0	120 (73)	90 (66)	210 (70)
OPV1	162 (98)	130 (96)	292 (97)
OPV2	161 (97)	119 (88)	280 (93)
OPV3	138 (89)	99 (76)	237 (83)
Baby breastfed	170 (100)	134 (100)	304 (100)
Age first given water			
≤1 month	6 (4)	9 (6)	15 (5)
1-3 months	21 (12)	9 (6)	30 (10)
3-6 months	90 (53)	62 (44)	152 (49)
≥6 months	36 (21)	41 (29)	77 (25)
Not yet given water	17 (10)	19 (14)	36 (12)
Baby had diarrhea	80 (47)	55 (39)	135 (44)
Median diarrhea episodes (range)	1 (1 - 5)	1 (1 - 4)	1 (1 - 5)
Baby treated for diarrhea	70 (88)	49 (89)	119 (88)
Baby given ORS	66 (83)	50 (91)	116 (86)
Where ORS obtained			
Hygiene kit	11 (17)	8 (16)	19 (16)
Bought	17 (26)	16 (32)	33 (28)
Hospital, clinic, or health center	40 (61)	29 (58)	69 (59)
HSA	3 (5)	3 (6)	6 (5)

\*For some items, N may vary by small numbers

**Table 10. Program participation characteristics among follow-up antenatal clinic survey respondents, Blantyre and Salima Districts, May 2007 – March 2008**

<b>Characteristic (%)</b>	<b>Blantyre (N*=182)</b>	<b>Salima (N*=148)</b>	<b>Total (N*=330)</b>
Did not receive refills	15 (9)	4 (3)	19 (6)
Received only one refill	24 (15)	24 (17)	48 (16)
Received only two refills	56 (34)	43 (31)	99 (33)
Received three or more refills	68 (42)	70 (50)	138 (45)
Last free bottle received			
<1 month before survey	58 (47)	98 (72)	156 (60)
1-2 months	23 (19)	25 (18)	48 (19)
>2 months	35 (28)	12 (9)	47 (18)
DK	7 (6)	1 (1)	8 (3)
<i>WaterGuard</i> available at local shop	172 (95)	122 (87)	294 (91)
Kit item liked best			
Soap	12 (7)	8 (5)	20 (6)
<i>WaterGuard</i>	74 (41)	71 (48)	145 (44)
Thanzi ORS	8 (4)	10 (7)	18 (5)
Bucket	88 (48)	59 (40)	147 (45)
Hygiene kit bucket used for drinking water	168 (92)	143 (97)	331 (94)
Hygiene kit bucket used for other	10 (5)	4 (3)	14 (4)
Hygiene kit bucket observed in home as water storage container	158 (87)	141 (95)	299 (91)
Hygiene kit <i>WaterGuard</i> used to treat drinking water	181 (99)	147 (100)	328 (>99)
Hear about <i>WaterGuard</i> at health centre	178 (98)	145 (99)	323 (98)
Once	40 (22)	21 (14)	61 (19)
Twice	59 (33)	41 (28)	100 (31)
Three times	34 (19)	35 (24)	69 (21)
More than three times	45 (25)	48 (33)	93 (29)
Any HSA visits	153 (84)	147 (99)	300 (91)
1 visit	67 (37)	3 (2)	70 (21)
2 visit	39 (21)	15 (10)	54 (16)
3 visit	28 (15)	22 (15)	50 (15)
4 visit	15 (8)	28 (19)	43 (13)
>4 visits	4 (2)	79 (53)	83 (25)
Median number visits (range)	1 (0 - 8)	5 (0 - 10)	3 (1 - 10)
HSA demonstrated <i>WaterGuard</i> use	153 (98)	146 (99)	299 (99)
HSA demonstrated hand washing	155 (99)	146 (100)	301 (>99)

\*For some items, N may vary by small numbers

**Table 11. *WaterGuard* knowledge, use, and hand hygiene practices of program participants at baseline and follow-up by health facility, May 2007 – February 2008**

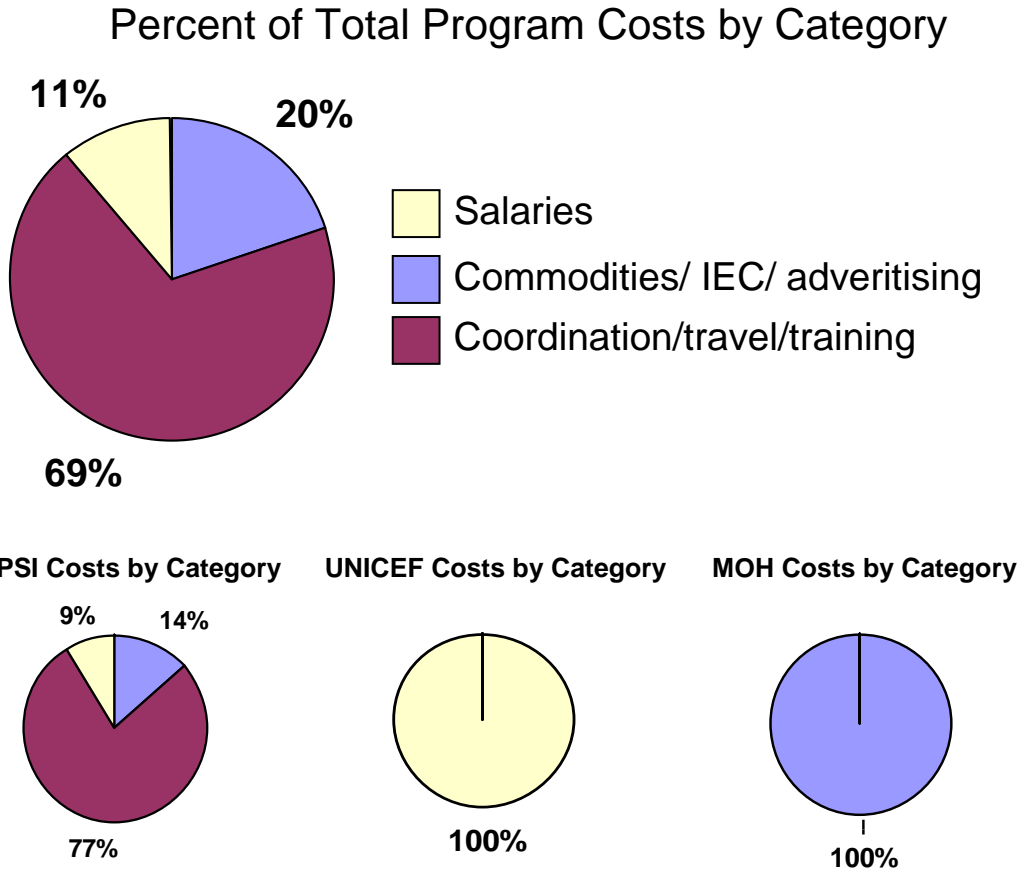
District	Clinic (N)	Available at follow-up	Knows how to use <i>WaterGuard</i> (%)			Positive chlorine test and <i>WaterGuard</i> observed (%)			Purchased WG, positive Cl test, WG observed (%)			Lathers hands completely soap (%)	
			Baseline	Follow-up	P-value	Baseline	Follow-up	P-value	Baseline	Follow-up	P-value	Baseline	Follow-up
Blantyre	1 (N=23)	19 (83)	4 (18)	12 (66)	0.02	0	13 (68)	0.0003	0	7 (37)	0.008	1 (4)	14 (74)
	2 (N=66)	49 (74)	27 (43)	24 (49)	0.04	4 (6)	6 (14)	0.3	4 (6)	3 (7)	0.7	27 (41)	32 (65)
	3 (N=31)	17 (55)	6 (19)	12 (71)	0.03	0	14 (82)	0.0002	0	8 (47)	0.005	7 (23)	12 (71)
	4 (N=14)	12 (86)	1 (9)	7 (58)	0.01	0	10 (83)	0.002	0	7 (58)	0.008	1 (7)	10 (83)
	5 (N=22)	19 (86)	6 (29)	14 (74)	0.004	0	8 (42)	0.005	0	7 (41)	0.008	2 (9)	14 (74)
	6 (N=41)	35 (85)	14 (34)	20 (57)	0.02	0	6 (18)	0.01	0	5 (16)	0.03	5 (12)	17 (49)
	7 (N=21)	18 (86)	9 (45)	11 (61)	0.3	0	7 (47)	0.008	0	5 (33)	0.03	3 (14)	8 (44)
	8 (N=13)	13 (100)	4 (33)	9 (69)	0.06	0	12 (92)	0.0005	0	3 (23)	0.08	3 (23)	10 (77)
Salima	9 (N=11)	11 (100)	0	7 (64)	0.06	0	9 (90)	0.005	0	8 (80)	0.008	0	9 (82)
	10 (N=30)	28 (93)	2 (11)	11 (39)	0.1	0	23 (85)	<.0001	0	9 (33)	0.003	8 (27)	18 (64)
	11 (N=11)	11 (100)	0	9 (82)	0.01	0	9 (82)	0.005	0	3 (27)	0.08	1 (9)	7 (64)
	12 (N=17)	16 (94)	5 (36)	13 (81)	0.06	1 (6)	16 (100)	0.0002	1 (6)	13 (81)	0.0005	4 (27)	15 (94)
	13 (N=11)	11 (100)	0	9 (82)	0.05	0	10 (91)	0.003	0	4 (36)	0.08	1 (10)	10 (91)
	14 (N=27)	24 (89)	7 (32)	20 (83)	0.0005	1 (4)	20 (83)	<.0001	1 (4)	13 (54)	0.0005	7 (26)	19 (79)
	15 (N=51)	47 (92)	12 (29)	26 (57)	0.005	0	31 (67)	<.0001	0	5 (12)	0.05	13 (30)	29 (62)

**Table 12. *WaterGuard* knowledge, use, and hand hygiene practices among relatives and friends at baseline and follow-up, Blantyre and Salima Districts, May 2007 – February 2008**

Characteristic (%)	BLANTYRE			SALIMA			TOTAL		
	Baseline (N*=220)	Follow-up (N*=155)	p-value	Baseline (N*=139)	Follow-up (N*=120)	p-value	Baseline (N*=359)	Follow-up (N*=275)	p-value
Pours or uses tap to remove drinking water	15 (7)	11 (7)	0.4	0	10 (8)	0.002	15 (4)	21 (8)	0.009
Protects drinking water to make it safe	183 (84)	140 (91)	0.02	105 (77)	114 (95)	<0.0001	288 (81)	254 (93)	<0.0001
Use any method to protect water in past 2 days	51 (24)	80 (62)	<0.0001	37 (27)	84 (79)	<0.0001	88 (25)	164 (69)	<0.0001
Heard of <i>WaterGuard</i>	207 (94)	153 (99)	0.008	109 (79)	118 (99)	<0.0001	316 (88)	271 (99)	<0.0001
Heard about <i>WaterGuard</i> from friend in program	n/a	78 (52)	n/a	n/a	81 (69)	n/a	n/a	159 (59)	n/a
Knows how to use <i>WaterGuard</i>									
2-4 caps per 20 liters	107 (52)	100 (65)	0.001	42 (39)	72 (61)	<0.0001	149 (48)	172 (63)	<0.0001
Wait ≥ 30 minutes before drinking	107 (52)	94 (61)	0.03	41 (37)	81 (69)	<0.0001	148 (47)	175 (65)	<0.0001
Knows both of the above	65 (32)	71 (46)	0.002	20 (19)	60 (51)	<0.0001	85 (27)	131 (48)	<0.0001
<i>WaterGuard</i> use									
Ever used <i>WaterGuard</i>	146 (66)	127 (82)	<0.0001	64 (47)	105 (88)	<0.0001	210 (59)	232 (84)	<0.0001
Treated with <i>WaterGuard</i> in last 2 days	34 (16)	46 (30)	<0.0001	14 (10)	63 (53)	<0.0001	48 (14)	109 (40)	<0.0001
<i>WaterGuard</i> bottle observed in home	18 (8)	32 (21)	0.0006	5 (4)	46 (38)	<0.0001	23 (6)	78 (28)	<0.0001
Positive chlorine (cl) test	26 (12)	40 (28)	0.0004	4 (3)	58 (50)	<0.0001	30 (9)	98 (38)	<0.0001
Positive cl test and <i>WaterGuard</i> observed	7 (3)	26 (18)	<0.0001	1 (1)	38 (33)	<0.0001	8 (2)	64 (25)	<0.0001
Purchased <i>WG</i> , positive cl test, <i>WG</i> observed	7 (3)	25 (17)	<0.0001	1 (1)	34 (30)	<0.0001	8 (2)	59 (23)	<0.0001
Soap observed in home	166 (76)	121 (79)	0.3	85 (62)	86 (72)	0.05	251 (71)	207 (76)	0.03
Hand washing demonstration									
Uses soap	55 (25)	100 (65)	<0.0001	22 (17)	81 (68)	<0.0001	77 (22)	181 (66)	<0.0001
Lathers hands completely with soap	46 (21)	89 (57)	<0.0001	18 (14)	76 (63)	<0.0001	64 (18)	165 (60)	<0.0001

\*For some items, N may vary by small numbers

**Figure 3. Total, PSI, UNICEF, and MOH program costs by category**



## **APPENDIX A**

### **Hygiene Promotion for Diarrheal Disease Prevention through the Government of Malawi's Perinatal Care System**

**Investigator: Anandi Sheth, MD, Centers for Disease Control and Prevention**

#### **Informed Consent for Antenatal Clinic Survey (#1) - Oral**

(Read ALL. If the participant agrees, continue with the interview.)

Hello, I am working on an evaluation with UNICEF and the Centers for Disease Control and Prevention. We are working with the clinic staff on a program to improve the health of mothers and babies. The clinic staff gave you a "hygiene kit" and told you how to use it. We want to learn how this program works, so we would like to ask you some questions. You may choose to be part of the program, or you can decline to participate. There are three parts to the program.

First, if you choose to be part of the program, we will ask you questions today about your family's hand washing practices and how you collect, treat, and store your drinking water. These questions will take about 15 minutes. We will then ask you where you live so we can visit you at home.

Second, we will visit you at home to see how you store and use water. Please do not use your hygiene kit until after we visit your home.

Third, we will visit you again in your home after about 9 months to ask you about how you treat and store your water, hand washing practices in your home, and what you think of the project. We will also want to see the storage vessel you are using and do a simple test on your water.

Being part of this program presents no known risk to you. Your participation may benefit you and your family because the things we give you can make your water and home cleaner and safer. Taking part in the program may also help other people. If we show that this program helps mothers and their babies, the program may continue.

We will keep your answers to all questions secret. We will lock up the survey forms. We will not put your name or the name of your family members on any report of this project. Your participation today is voluntary. If there are questions you do not like, you do not have to answer them. You can stop at any time after giving your consent. If you stop the program early, you may keep the hygiene kit. There are no penalties for not participating in the program. Your participation in the program will not affect your care in the clinic. If you have questions or concerns about the program, you may contact your clinic's environmental health officer.

## **APPENDIX B**

### **Hygiene Promotion for Diarrheal Disease Prevention through the Government of Malawi's Perinatal Care System**

**Investigator: Anandi Sheth, MD, Centers for Disease Control and Prevention**

#### **Informed Consent for Diffusion Survey (#2) - Oral**

(Read ALL. If the participant agrees, continue with the interview.)

Hello, I am working on an evaluation with UNICEF and the Centers for Disease Control and Prevention. As you may know, diarrhea is a serious problem where you live. Drinking unsafe water and not washing hands can cause diarrhea. We are working with the staff and pregnant women at clinics nearby on a program to improve the health of mothers and babies. One of your friends or family members is part of this program for pregnant women at the clinic.

We are inviting you to be in this program to see how the program in the clinic affects mothers like you who are not pregnant, but who have friends or family members who are pregnant and go to the clinic. You may choose to be part of the program, or you can decline to participate. There are two parts to the program.

First, if you choose to be part of the program, we will ask you questions today about your family's hand washing practices and how you collect, treat, and store your drinking water. These questions will take between 15-30 minutes. We will then want to see how you store and use water, and we will do a simple chemical test on your stored water.

Second, we will visit you again in your home in about 9 months after the project in the clinic is finished to ask you about how you store and treat your water, and hand washing practices in your home. We will also want to see the storage vessel you are using and do a simple test on your water.

Being part of this program presents no known risk to you. Taking part in the program may help other people. If we show that this program helps mothers and their babies, the program may continue.

We will keep your answers to all questions secret. We will lock up the survey forms. We will not put your name or the name of your family members on any report of this project. Your participation today is voluntary. If there are questions you do not like, you do not have to answer them. You can stop at any time after giving your consent. There are no penalties for not participating in the program. If you have questions about the program, you may contact the clinic's environmental health officer. If you have questions about your rights as a person in the program, or if you think you have been injured by being in this program, you may contact the clinic's environmental health officer.



- 13) Kodi ndi anthu angati amene amakhala nyumba mwanu kuphatikizapo inuyo masiku onse? \_\_\_\_\_  
How many people from your family, including yourself, permanently live in your house?
- 14) Kodi nyumba yanu ili ndizipinda zogona zingati? \_\_\_\_\_ rooms  
How many rooms are there in your house where people sleep?
- 15) Kodi muli ndi: In your house is there: *(Please circle Yes or No after each item).*
- |                                       |     |    |
|---------------------------------------|-----|----|
| a) Magetsi? Electricity               | Yes | No |
| b) Wailesi? A radio                   | Yes | No |
| c) Njinga? A bicycle                  | Yes | No |
| d) Njinga yamoto? A motorcycle        | Yes | No |
| e) Galimoto? A car                    | Yes | No |
| f) Nyali ya paraffin? A paraffin lamp | Yes | No |
| g) Ngolo? An oxcart                   | Yes | No |
| h) Wantchito? A domestic worker       | Yes | No |
- 16) Kodi muli ndi munda olima? Yes  
Do members of your household work on the family's agricultural land? No  
N/A
- 17) Muli pabanja? *(Read choices. Circle one)*  
What is your marital status?
- Okwatiwa. Married → Go to 18)
  - Osakwatiwa, mukukhala nokha. Single, living alone → Go to 20)
  - Osakwatiwa, mukukhala ndi makolo kapena abale. Single, living with parents/family members → Go to 20)
  - Banja linatha. Separated → Go to 20)
  - Wamasiye. Widowed → Go to 20)
- 18) Kodi amuna anu sukulu analekezera kalasi yanji? *(Read choices. Circle one)*  
How much school did your husband complete?
- None
  - Some Primary (Standard 1-7)
  - Completed Primary (Standard 8)
  - Some Secondary (Form 1-3)
  - Completed Secondary (Form 4)
  - More than Secondary (Started university/ colleges and above)
  - DK
- 19) Kodi abambo amnyumba muno amatha kuwerenga? Yes  
Can your husband read? No  
DK
- 20) Kodi ndi ana angati osapitilira zaka zisanu amene amakhala nyumba mwanu? \_\_\_\_\_ *(If "0", Go to 24)*  
How many children less than 5 years old live in this household? *(If none, write "0", and go to 24)*
- 21) Kodi mwa ana osapitilira zaka zisanuwa alipo amene anatsegulapo mmimba sabata ziwiri zapitatazi?  
Have any of the children less than 5 years old had diarrhea in the past two weeks?  
Yes  
No → Go to 24)  
DK → Go to 24)

- 22) *If YES*, Kodi mwa ana amene anatsagulammimbawa alipo amene analandira chithandizo? **Yes**  
 Were any of them treated for the diarrhea? **No**  
**DK**
- 23) *If YES*, Kodi alipo amene anapatsidwapo Thanzi ORS? **Yes**  
 Were they given fluid to drink made from a special packet **No**  
 called Thanzi oral rehydration salts? **DK**

Unless specified, do not read the answer choices. Circle the choice that best represents the participant's answer. If there are multiple choices, ask "Anything else" after the answer until the participant has no further answers.

## KNOWLEDGE ABOUT DIARRHEA

- 24) Kodi chimene chimayambitsa matenda otsekula mmimba ndi chiyani? (*Multiple responses possible. Do not read. Circle all that apply.*) What causes diarrhea?
- a) Drinking bad water
  - b) Eating bad food
  - c) Unwashed fruit/ vegetables
  - d) Flies/ insects
  - e) Poor hygiene
  - f) Other (*Specify*) \_\_\_\_\_
  - g) DK
- 25) Kodi pakhomu panu mukadwala matenda otsegula mmimba mumalandira chithandizo chotani? (*Multiple responses possible. Do not read. Circle all that apply.*) At home, how do you treat diarrhea in yourself or your family members?
- a) Do not treat
  - b) Increase liquid intake
  - c) Decrease liquid intake
  - d) Decrease food intake
  - e) Use Thanzi oral rehydration salt packets (ORS)
  - f) Use sugar-salt solution
  - g) Pill or syrup
  - h) Injection
  - i) Home remedy
  - j) Other (*Specify*) \_\_\_\_\_
  - k) DK
- 26) Kodi mungadziteteze bwanji ku matenda otsegula mmimba? (*Multiple responses possible. Do not read. Circle all that apply.*) How can you prevent you or your family members from getting diarrhea?
- a) Cannot prevent
  - b) Wash hands more often
  - c) Cook food thoroughly
  - d) Cover food
  - e) Boil or treat water
  - f) Wash vegetables and fruit
  - g) Clean cooking utensils/ vessels
  - h) Other (*Specify*) \_\_\_\_\_
  - i) DK

## WATER-HANDLING PRACTICES

- 27) Kodi madzi akumwa mumatunga kuti? (*Do not read. Circle one.*)  
What is your main source of water for drinking at home?
- a) Tap inside the house
  - b) A piped public tap (kiosk)
  - c) Water piped into a yard or plot
  - d) Water from protected borehole/ well
  - e) Open well in residence (not a borehole)
  - f) Open community well (a traditional public well)
  - g) Protected spring
  - h) Open spring
  - i) River, dam, or surface water for drinking
  - j) Other (*Specify*) \_\_\_\_\_
- 28) Kodi mumasunga madzi akumwa? **Yes**  
Do you store your drinking water? **No → Go to 32)**  
**DK → Go to 32)**
- 29) *If YES*, Kodi ndi chiwiya chanji chomwe mumasungira madzi akumwa? (*Do not read. Circle one*)  
How do you usually store your drinking water?
- a) Bucket
  - b) Clay pot
  - c) Jerry can
  - d) Cooking pot
  - e) Plastic bottles
  - f) Water tank/ barrel
  - g) Other (*Specify*) \_\_\_\_\_
- 30) Kodi madzi anu mumatunga bwanji kuchokera mmene mumasungiramo madzi? (*Do not read. Circle one.*)  
How do you remove water from your container?
- a) Scoop out with ladle, cup, or hand
  - b) Pour
  - c) Tap
  - d) Other (*Specify*) \_\_\_\_\_
- 31) Kodi chimene mumasungira madzichi chiri ndi chivindikiro? **Yes**  
Does the container have a lid? **No**  
**DK**

## WATER TREATMENT

- 32) Kodi madzi akumwa mumawateteza kuti akhale aukhondo? **Yes**  
Do you protect your drinking water to make it safe? **No → Go to 35)**  
**DK → Go to 35)**
- 33) *If YES*, Kodi madzi anu kuti akhale aukhodo mumawatani? (*Multiple responses possible. Do not read. Circle all that apply.*) What do you do to make your drinking water safe?
- a) Boil
  - b) Filter
  - c) Let settle
  - d) Treat with *WaterGuard* (liquid)
  - e) Treat with *WaterGuard Wa Ufa*
  - f) Other (*Specify*) \_\_\_\_\_

- 34) Ndiliti lomwe munawateteza madzi anu? (*Do not read. Circle one*)  
 When did you last treat your drinking water?  
 a) Today  
 b) Yesterday  
 c) 2 or more days ago  
 d) DK

## KNOWLEDGE ABOUT WATERGUARD

- 35) Kodi munamvapo za WaterGuard? **Yes**  
 Have you heard of *WaterGuard*? **No → Go to 42)**
- 36) Kodi WaterGuard ndi chiyani? (*Multiple responses possible. Do not read. Circle all that apply.*)  
 What is *WaterGuard*?  
 a) A chemical  
 b) A solution to make my water clean and safe for drinking  
 c) Something for my water, but I don't know what it does  
 d) Other (*Specify*) \_\_\_\_\_  
 e) DK
- 37) Kodi mumayika zivindikiriro zabotolo la WaterGuard zingati m'ndowa ya m'madzi akumwa? \_\_\_\_\_caps  
 How many caps of *Waterguard* should be added to a pail of water? (*Circle DK if "I don't know"*) **DK**
- 38) Kodi tingadikilire nthawi yayitali bwanji tisanayambe kumwa madzi amene tathira WaterGuard? (*Do not read. Circle one.*) How long should someone wait to drink water after treating it with *WaterGuard*?  
 a) Immediately  
 b) Less than 30 minutes (but not immediately)  
 c) 30 minutes or more  
 d) DK
- 39) Kodi munagwiritsako ntchito WaterGuard? **Yes**  
 Have you ever used *WaterGuard*? **No → Go to 41)**  
**DK → Go to 42)**
- 40) Kodi WaterGuard munamugula kuti? (*Multiple responses possible. Do not read. Circle all that apply. If the participant answers, "I bought it," please ask where.*) How did you obtain *WaterGuard*?  
 a) Community Health Worker/ HSA → *Go to 42)*  
 b) Friend/ relative → *Go to 42)*  
 c) Local shop (in the villages) → *Go to 42)*  
 d) Retail shop (in the trading center) → *Go to 42)*  
 e) Pharmacist → *Go to 42)*  
 f) Other (*Specify*) \_\_\_\_\_ → *Go to 42)*
- 41) (*If NO to 39*), Ndi chifukwa chiyani simunagwiritseko ntchito WaterGuard? (*Multiple responses possible. Do not read. Circle all that apply.*) Why have you not used *WaterGuard*?  
 a) Can't afford  
 b) Don't need  
 c) Fear of adding chemicals to water  
 d) Water is clean  
 e) Don't like the smell  
 f) Other (*Specify*) \_\_\_\_\_

## HAND HYGIENE/ SANITATION

42) Kodi mumasamba mmanja nthawi yanji? (*Multiple responses possible. Do not read. Circle all that apply.*)

When do you wash your hands?

- a) After using the toilet
- b) Before eating
- c) Before cooking
- d) After diaper change
- e) When they are dirty
- f) Other (*Specify*) \_\_\_\_\_

43) Kodi muli ndi sopo nyumba muno? **Yes**

Do you have soap in the house? **No**

**DK**

44) Kodi mukafuna kudzithandiza mumapita kuti? (*Do not read. Circle one.*) Where do you usually go to the toilet?

- a) Own flush toilet
- b) Shared flush toilet
- c) Traditional pit toilet
- d) VIP latrine
- e) Bush or field as latrine
- f) Other type of latrine (*Specify*) \_\_\_\_\_

- *If person is enrolled in the community (Friend/ relative) → Go directly to page 7, “Home Environmental Assessment,” Question 47)*
- *If the person is enrolled in the clinic (Pregnant woman) → Continue below*

*Tifuna tikawone momwe mumasungira madzi kwanu. Mungatiwuze komwe mumakhala kuti tidzakuchezereni mawa? We will now want to see how you store and use water. Can you describe the location of where you live so we can visit your home this afternoon or tomorrow morning?*

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*Kodi m'mawa tingakupezeni nthawi yanji? \_\_\_\_\_*

*What is the best time to visit you on today or tomorrow?*

*Kodi muli ndi mzanu wamkazi yemwe sali ndi pakati koma ali ndi Mwana osapitilira zaka zisanu amene tingamufunseko mafunso omwe takufunsaniwa? tiuzeniko mayina atatu ndikomwe amakhala ndipo ticheza ndi mmodzi. We would also like to ask one female relative or friend from your village who is not pregnant that lives in a different home who has a child under age 5 these questions. Can you give us the name and location of three people so we may choose one to ask?*

Name

Location

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

**BE SURE TO REMOVE THE WATERGUARD/SOAP BAG FROM THE HYGIENE KIT.**

**Zikomo kwambiri!!!! Thank you very much for your time.**

## HOME ENVIRONMENTAL ASSESSMENT

45) Home Visit Date \_\_\_\_/\_\_\_\_/2007

46) Interviewer \_\_\_\_\_

*Muli bwanji? Ine dzina langa ndi \_\_\_\_\_ Ndikugwira ntchito pa Chipatala cha \_\_\_\_\_ ndi a UNICEF. Tikufuna ticheze ndi \_\_\_\_\_. Mwakhala mukutenga nawo mbali mupologalamu ya Safe Water and Hygiene yokhudza amayi oyembekezera. Tikufuna ticheze nanu pa nkhani yokhudza zapabanja panu kwa kanthawi kochepa. Kodi ndikhoza kucheza nanu panopa? (If No) Nanga lero ndingacheze nanu nthawi inayake? (If yes) nthawi yanji? \_\_\_\_\_ (if no for that day), ndingacheze nanu liti ndipo nthawi yanji musabatayi? \_\_\_\_\_ Ganizani mofatsa pa funso liri lonse. Yankhani momwe mungathere. Mungathe kusankha osayankha funso liri lonse.*

*Hello. My name is \_\_\_\_\_ and I am working with the \_\_\_\_\_ clinic and UNICEF. We would like to speak with \_\_\_\_\_ (name of participant). You have been participating in a Safe Water and Hygiene project for pregnant women. We would like to speak with you for a few minutes about your household practices. May I chat with you now? (If NO, "When would be more convenient for you?") Please think carefully about each question, and answer as well as you can. You can choose not to answer any of the questions.*

**For ALL questions below, record OBSERVATIONS made by the interviewer.**

47) What is the main roofing material for the household's dwelling? (*Circle one*)

- a) Thatch/ natural material
- b) Metal/Iron Sheets
- c) Iron and tiles
- d) Asbestos
- e) Cement
- f) Other (*Specify*) \_\_\_\_\_

48) What is the main flooring material? (*Circle one*)

- a) Dung, dirt, earth, or sand
- b) Wood/ plank
- c) Cement
- d) Tiles
- e) Other (*Specify*) \_\_\_\_\_

49) What sort of toilet facility do household members usually use? (*Circle one*)

- a) No facilities
- b) Traditional pit latrine
- c) VIP latrine
- d) Other (*Specify*) \_\_\_\_\_

50) Is soap present in the house? **Yes** **No**

51) Is there a place for washing hands (*defined as water and soap in the same location*)? **Yes** **No**

52) Is there a bottle of *WaterGuard*? **Yes** **No**

53) Is there a water storage container? **Yes** **No → Go to 56)**

54) **If YES**, What type of container is the drinking water stored in? (*Circle all that apply*)

- a) Bucket
- b) Clay pot
- c) Jerry can
- d) Cooking pot
- e) Plastic bottles
- f) Water tank/ barrel
- g) Other (*Specify*)\_\_\_\_\_

55) Kodi ndingayeze nawo madziwa? **May I take a sample of this water?**

**Result of chlorine test:**

- a) Negative (no color change)
- b) Positive (pink color)
- c) Test refused

56) Tikufuna tioneerereko m`mene mmasambira mmanja? (*Please circle yes or no after each*):

**We would now like to watch you demonstrate hand washing.**

- |  |            |           |
|--|------------|-----------|
| a) Uses soap   | <b>Yes</b> | <b>No</b> |
| b) Lathers hands completely                              | <b>Yes</b> | <b>No</b> |
| c) Wipes hands dry with a clean towel or air dries hands | <b>Yes</b> | <b>No</b> |

***Zikomo kwambiri!!!! Thank you very much for your time.***

**FOR PREGNANT WOMEN ENROLLED IN CLINIC**

57) Kodi munaphunzitsidwa za phukusi la ukhondo kuchipatala? **Yes** **No** **DK**

**Were you taught about use of the hygiene kit at the clinic?**

**➤ GIVE THE PARTICIPANT THE WATERGUARD/SOAP BAG.  
SHOW THE PARTICIPANT HOW TO USE WATERGUARD AND SOAP.**

# APPENDIX D

## THANZI ORS



- Onetsetsani kuti ziiyiya zomwe mukugwiritsa ntchito ndi zotsuka bwino ndipo kumbukirani kusamba m'manja ndi sopo musanayambe kum'mwetsa mwana wanu.
- Thirani katatu madzi wotetezedwa ndi WaterGuard pogwiritsa ntchito botolo la Fanta kapena Coca-cola ndipo sungunulani mankhwala onse a m'paketi m'madzimo.
- M'mwetseni mwana wanu Thanzi ORS pang'ono pang'ono komanso pafupi pafupi.
- Gulani ndi kusunga Thanzi ORS m'nyumba mwana nthawi zonse ndipo mwetsani mwana wanu akangoyamba kutsegula m'mimba kuti mubwezeretse m'phamvu m'thupi.
- Pitolizani kuyamwitsa mwana wanu monga mwanthawi zonse ngati ali woyamwa.



## PHUKUSI LA UKHONDO

- Ndowa yosungira Madzi
- Sopo
- Mapaketi Awiri A Thanzi ORS
- Botolo La WaterGuard wa Madzi



## BOTOLO LA WATERGUARD WA MADZI



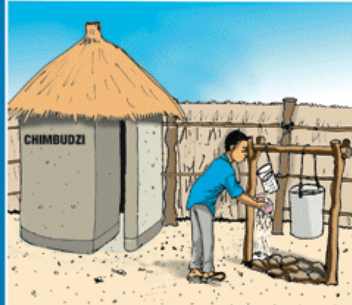
- Tetezani madzi anu pothira WaterGuard tsiku lili lonse chaka chonse kuti muphe tizilombo toyambitsa matenda otsegula m'mimba.
- Thirani tizivindikiro tiwiri ta WaterGuard mu ndowa imodzi yodzadza ndi madzi koma ngati madzi anu m'watunga ku mtsinje kapena ku chitsime thirani tizivindikiro tinayi. Chonde tsatirani malangizo omwe alembedwa pa botolo.

## NDOWA



- Onetsetsani kuti mpopi wa pa ndowa yanu ndi womangidwa bwino, musanayambe kugwiritsa ntchito ndiponso kuti mlangizi wa za umoyo wakuphunzitsani bwino lomwe za kagwiritsidwe ntchito ka ndowayi.
- Ngati mpopi wanu ukuloza kumwamba, ndiye kuti ndi wotsegula, mukhonzani kutunga madzi m'mene mungathere, osagwilira mpopiwo.
- Ngati uli choyan'gana pansu ndiye kuti ndi wotsegula koma mufunika kuugwirizira potunga madzi.
- Ngati mpopi wanu uli cha pakatikati ndiye kuti ndi wotseka, simungathe kutunga madzi.
- Onetsetsani kuti ndowa yanu ndiyovindikira nthawi zonse.
- Onetsetsani kuti madzi omwe mukusunga mu ndowa yanuyo ndi okhawa amene ali wotetezedwa ndi WaterGuard. Mukafuna kutunga madzi gwiritsani ntchito mpopi nthawi zonse ndipo kapu yanu ikhale yotsuka bwino.

## SOPO



- Onetsetsani kuti mwasamba m'manja ndi sopo amene ali mu phukusimu makamaka pochokera ku chimbudzi, mukasintha thewera la mwana musanakhudze chakudya chilichonse.



- 12) Pa nthawi yomwe munali oyembekezera munapitako kangati ku sikelo, kupatula ulendo omwe munapita kokachira? (**Do not read. Circle ONLY ONE**). How many visits in total have you made to the health facility during this pregnancy, not including the delivery?
- 1
  - 2
  - 3
  - 4
  - 5 or more
- 13) Kodi munachilira (munakaberekera) kuti? (**Do not read. Circle ONLY ONE**) Where did you deliver?
- Home → **Go to 14**)
  - Neighbor's home → **Go to 14**)
  - Clinic/ hospital/ health centre (*Specify*) \_\_\_\_\_ → **Go to 14**)
  - Other (*Specify*) \_\_\_\_\_ → **Go to 14**)
  - Not yet delivered → **Go to 25**)
- 14) Kodi ndi ndani anakuthandizani pa nthawi yomwe mumachira? (**Do not read. Circle ALL that apply**) Who assisted you with the delivery of this baby?
- Doctor/ nurse/ midwife
  - TBA (Traditional Birth Attendant)
  - HSA (Health Surveillance Assistant)
  - Relative/ friend
  - Other (*Specify*) \_\_\_\_\_
  - No one assisted
- 15) Kodi mwanayu alipo? **Yes**  
Is the baby still alive? **No → Go to 25)**
- 16) Nanga ali ndi miyezi ingati tsopano? How old is the baby now? \_\_\_\_\_ **months**
- 17) Kodi mwanayu mwakhala mukumuyamwitsa? **Yes**  
Has the baby been breastfed? **No**
- 18) Kodi mwanayu munayamba kumupatsa madzi kapena zakudya zina zamadzi madzi ali ndi miyezi ingati? (**Do not read. Circle ONLY ONE**) At what age was the baby first given water or anything made with water?
- ≤1 month
  - 1-3 months
  - 3-6 months
  - ≥6 months
  - Not yet given water
- 19) Kodi mwanayu anayamba wawonedwapo ndi achipatala? **Yes**  
Has the baby been seen by a health care provider? **No**  
**DK**
- 20) Chibadwireni mwanayu, kodi anayamba watsegulapo m'mimba? **Yes**  
Has the baby had diarrhea? **No → Go to 25)**  
**DK → Go to 25)**
- 21) Nanga watsegulapo kangati? How many episodes of diarrhea has the baby had? \_\_\_\_\_ **episodes**
- 22) Kodi mwanayu anapatsidwapo chithandizo choletsa kutsekula m'mimba? **Yes**  
Was the baby treated for the diarrhea? **No**  
**DK**
- 23) Kodi mwanayu munamwetsapo Thanzi ORS? **Yes**  
Was the baby given fluid to drink made from Thanzi ORS packets? **No → Go to 25)**

DK → Go to 25)

- 24) Kodi ORS munampeza kuti? (**Do not read. Circle ALL that apply.**) Where did you obtain the ORS packets?
- From the hygiene kit obtained from the health centre
  - I bought them
  - From the hospital, clinic, or health centre
  - From the HSA (Health Surveillance Assistant)
  - Other (*Specify*) \_\_\_\_\_

## KNOWLEDGE ABOUT DIARRHEA

- 25) Kodi chimene chimayambitsa matenda otsekula mmimba ndi chiyani? (**Do not read. Circle ALL that apply.**)

What causes diarrhea?

- Drinking bad water
  - Eating bad food
  - Unwashed fruit/ vegetables
  - Flies/ insects
  - Poor hygiene/ not washing hands
  - Poor sanitation/ lack of latrine
  - Other (*Specify*) \_\_\_\_\_
  - DK
- 26) Kodi pakhomo panu mukadwala matenda otsegula mmimba mumalandira chithandizo chotani? (**Do not read. Circle ALL that apply.**) At home, how do you treat diarrhea in yourself or your family members?
- Do not treat
  - Increase liquid intake
  - Decrease liquid intake
  - Decrease food intake
  - Use Thanzi oral rehydration salt packets (ORS)
  - Use sugar-salt solution
  - Pill or syrup
  - Injection
  - Go to the hospital, clinic, or health centre
  - Home remedy/ traditional medicine (*Specify*) \_\_\_\_\_
  - Other (*Specify*) \_\_\_\_\_
  - DK

- 27) Kodi mungadziteze bwanji ku matenda otsegula mmimba? (**Do not read. Circle ALL that apply.**)

How can you prevent you or your family members from getting diarrhea?

- Cannot prevent
- Wash hands more often/ improve hygiene
- Cook food thoroughly
- Cover food
- Boil or treat water
- Wash vegetables and fruit
- Clean cooking utensils/ vessels
- Good sanitation/ use latrines
- Other (*Specify*) \_\_\_\_\_
- DK

## WATER-HANDLING PRACTICES

- 28) Kodi madzi akumwa mumatunga kuti? (**Do not read. Circle ONLY ONE. If more than one answer is given, please ask for the MAIN one and circle only one.**) What is your main source of water for drinking at home?

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>Tap inside the house</li> <li>A piped public tap (kiosk)</li> <li>Water piped into a yard or plot</li> <li>Water from protected borehole/ well</li> <li>Open well in residence (not a borehole)</li> </ol> | <ol style="list-style-type: none"> <li>Open community well (traditional public well)</li> <li>Protected spring</li> <li>Open spring</li> <li>River, dam, or surface water for drinking</li> </ol> |
|---|---|

j) Other (*Specify*) \_\_\_\_\_

29) Kodi mukuganiza kuti madzi omwe mumamwawa ndi abwino kumwa musanaateteze? **Yes**  
 Do you think the drinking water from your main source is safe to drink without treating? **No**  
**DK**

30) Kodi mumasunga madzi akumwa? **Yes**  
 Do you store your drinking water? **No → Go to 33)**  
**DK → Go to 33)**

31) **If YES**, Kodi ndi chiyiwa chanji chomwe mumasungira madzi akumwa? (**Do not read. Circle ONLY ONE**)

How do you usually store your drinking water?

- a) Bucket
- b) Clay pot
- c) Jerry can
- d) Cooking pot
- e) Plastic bottles
- f) Water tank/ barrel/ drum
- g) Other (*Specify*) \_\_\_\_\_

32) Kodi madzi anu akumwa mumatunga bwanji kuchokera mmene mumasungiramo madzi?

(**Do not read. Circle ONLY ONE**) How do you remove drinking water from your container?

- a) Scoop out with ladle, cup, or hand
- b) Pour
- c) Tap
- d) Other (*Specify*) \_\_\_\_\_

## WATER TREATMENT

33) Kodi madzi akumwa mumawateteza kuti akhale aukhondo? **Yes**  
 Do you protect your drinking water to make it safe? **No → Go to 36)**  
**DK → Go to 36)**

34) **If YES**, Kodi madzi anu kuti akhale aukhondo mumawatani? (**Do not read. Circle ALL that apply.**) What do you do to make your drinking water safe?

- a) Boil
- b) Filter
- c) Let settle
- d) Treat with *WaterGuard* (liquid)
- e) Treat with *WaterGuard* Wa Ufa (powder)
- f) Treat with chlorine stock solution (i.e., from HSA or health facility)
- g) Cover container with lid
- h) Other (*Specify*) \_\_\_\_\_

35) Ndiliti lomwe munawateteza madzi anu? (**Do not read. Circle ONLY ONE**)

When did you last treat your drinking water?

- a) Today
- b) Yesterday
- c) 2 or more days ago
- d) DK
- e) Not applicable

## KNOWLEDGE ABOUT WATERGUARD

36) Kodi munamvapo za *WaterGuard*? **Yes**  
 Have you heard of *WaterGuard*? **No → Go to 54)**

37) Kodi munayamba mwaphunzitsidwa za m'mene mungagwiritsire ntchito *WaterGuard*? **Yes**  
 Has someone taught you how to use *WaterGuard*? **No → Go to 39)**

DK → Go to 39)

- 38) Kodi ndi ndani kapena kudzera njira iti imene inakupatsani chikhulupiliro kuti muthe kugwiritsa ntchito WaterGuard? **(Do not read. Circle ONE)** Which person or source gave you the most confidence to treat your drinking water with *WaterGuard*?
- Health care provider in the health facility (nurse, HSA, EHO, clinical officer)
  - HSA visiting the home
  - Friend/Neighbor/Relative
  - TBA
  - Shop owner
  - Radio advertisement
  - Brochure
  - Other (*Specify*) \_\_\_\_\_
  - None gave me confidence
- 39) Kodi mumayika zivindikiriro zabotolo la WaterGuard zingati m'ndowa ya m'madzi akumwa? \_\_\_\_\_ caps  
How many caps of *Waterguard* should be added to a pail of water? **(Circle DK if "I don't know")** DK
- 40) Kodi tingadikilire nthawi yayitali bwanji tisanayambe kumwa madzi amene tathira WaterGuard? **(Do not read. Circle ONLY ONE)** How long should someone wait to drink water after treating it with *WaterGuard*?
- Immediately
  - Less than 30 minutes (but not immediately)
  - 30 minutes or more
  - DK
- 41) Kodi mumadziwa komwe mungagule WaterGuard? Yes  
Do you know where you can buy *WaterGuard*? No  
DK
- 42) Tchulani mtengo wa WaterGuard? How much does it cost? \_\_\_\_\_ kwacha  
**(Circle DK if "I don't know")** DK
- 43) Kodi WaterGuard amapezeka mumasitolo kapena magolosale ndela lino muno? Yes  
Is *WaterGuard* usually available at the local shop in your village? No  
DK
- 44) Kodi munayamba mwamvapo za WaterGuardku chipatala pa nthawi yomwe munali oyemebkezera? Yes  
Did you hear about *WaterGuard* at the health centre during your pregnancy? No → Go to 46)  
DK → Go to 46)
- 45) **If YES**, Munamvapo kangati za WaterGuard kuchipatala? **(Do not read. Circle ONLY ONE)** How many times have you heard about *WaterGuard* at the health centre?
- Once
  - Twice
  - Three times
  - More than three times
- 46) Kodi mudamvaponso kuti za WaterGuard pambali pa kumva kuchipatala? **(Do not read. Circle ALL that apply)**  
Other than the health centre, where did you hear about *WaterGuard*?
- Radio
  - Television
  - Newspaper
  - Billboard
  - Flyer or brochure
  - HSA visiting the home
  - Community meeting
  - Village leader/ headman
  - Friend/neighbor/relative

- j) Local shop (in the villages)
- k) Other (*Specify*) \_\_\_\_\_
- l) No other place

- 47) Mutamva za WaterGuard, kodi munayamba mwauzapo anzanu kapena achibale za WaterGuard? **Yes**  
 Did you share any information that you heard about *WaterGuard* with any friends or family members? **No**  
**DK**

## **WATERGUARD USE**

- 48) Kodi munagwiritsako ntchito WaterGuard? **Yes → Go to 50)**  
 Have you ever used *WaterGuard*? **No**  
**DK**
- 49) (**If NO to 48**), Ndi chifukwa chiyani simunagwiritseko ntchito WaterGuard? (**Do not read. Circle ALL that apply.**)  
 Why have you not used *WaterGuard*?
- a) Can't afford **→Go to 54)**
  - b) Don't need **→Go to 54)**
  - c) Fear of adding chemicals to water **→Go to 54)**
  - d) Water is clean **→Go to 54)**
  - e) Don't like the smell **→Go to 54)**
  - f) Not available **→Go to 54)**
  - g) Use chlorine stock solution **→Go to 54)**
  - h) Don't know how to use **→Go to 54)**
  - i) Other (*Specify*) \_\_\_\_\_ **→Go to 54)**
- Go to 54)**
- 50) Kodi munampeza bwanji WaterGuard? (**Do not read. Circle ALL that apply. If the participant answers, "I buy it," please ask where.**) How did you obtain *WaterGuard*?
- a) HSA/ nurse/ clinic or health facility
  - b) Friend/ relative
  - c) Local shop (in the villages)
  - d) Retail shop (in the trading center)
  - e) Pharmacist
  - f) Other (*Specify*) \_\_\_\_\_
- 51) Pa chaka, kodi pali nthawi zina zomwe inu mumawona kuti ndi koyenera kugwiritsa ntchito WaterGuard? (**Do not read. Circle ALL that apply.**) Are there times of the year or certain occasions when you are more likely to use *WaterGuard*?
- a) Every day
  - b) Special occasions
  - c) For guests or visitors
  - d) During the rainy season
  - e) During cholera outbreaks
  - f) Other (*Specify*) \_\_\_\_\_
- 52) Kodi ndi nthawi yomaliza iti yomwe inu munagwiritsapo ntchito WaterGuard kuteteza madzi anu akumwa? (**Do not read. Circle ONLY ONE**) When was the last time you used *WaterGuard* to treat your drinking water?
- a) Today **→Go to 54)**
  - b) Yesterday **→Go to 54)**
  - c) This week **→Go to 54)**
  - d) More than one week ago, but this month **→Go to 54)**
  - e) More than one month ago **→Go to 53)**
  - f) DK **→Go to 53)**
- 53) Ndi chifukwa chiani munasiya kugwiritsa ntchito WaterGuard? (**Do not read. Circle ALL that apply.**) Why did you stop using *WaterGuard*?
- a) Can't afford
  - b) Don't need
  - c) Fear of adding chemicals to water
  - d) Water is clean
  - e) Don't like the smell

- f) Not available
- g) Use chlorine stock solution (i.e., from HSA or health facility)
- h) Don't know how to use
- i) Other (*Specify*) \_\_\_\_\_

## PROGRAM PARTICIPATION

- 54) Kodi mumatenga maola ochuluka bwanji kuti mukafike kuchipatala ya transporti? \_\_\_\_\_ **hours** \_\_\_\_\_ **min**  
How long does it take you to go from your home to the health centre (one way)?
- 55) Kodi kuyenda kupita kuchipatala kumafunika ndalama? **Yes**  
Does transportation to the health centre cost you money? **No → Go to 57)**  
**DK → Go to 57)**
- 56) **If YES**, Ndi ndalama zingati? How much money? \_\_\_\_\_ **kwacha**
- 57) Kodi wa zaumoyo anayamba wakuyenderani kuchokera pa nthawi yomwe munalandira ndowayi kuchipatala?  
Did an HSA come visit your home after the first time they brought you the hygiene kit?  
**Yes**  
**No → Go to 61)**  
**DK → Go to 61)**
- 58) **If YES**, Nanga anakuyenderani kangati mutalandira ndowa kuchipatala? \_\_\_\_\_ **times**  
How many times did the HSA visit after the first time you were brought the kit?
- 59) Kodi wa zaumoyo anayamba wakuwonetsani ndondomeko ya m'mene mungawiritsire ntchito WaterGuard poteteza madzi anu akumwa? **Yes**  
Did the HSA demonstrate how to use **No**  
*WaterGuard* to treat drinking water? **DK**
- 60) Kodi wazaumoyo anayamba wakuwonetsani ndondomeko ya momwe mungasambire m'manja? **Yes**  
Did the HSA demonstrate the steps of hand washing? **No**  
**DK**

## HYGIENE KIT

*Tsopano ndikufunsani mafunso okhudza phukusi la ukhondo lomwe munalandira kuchipatala momwe munali; ndowa, WaterGuard, soap ndi Thanzi ORS. Now I will ask you some questions about the hygiene kit you received in the health centre. This hygiene kit consisted of a bucket, WaterGuard, soap, and Thanzi ORS.*

- 61) Kodi muphukusi la ukhondo chimodzi chomwe munakonda ndi chiti? (**READ CHOICES. Circle ONE**)  
Which of the following items in the hygiene kit did you like the best?
- a) Soap Soap
  - b) *WaterGuard* *WaterGuard*
  - c) Thanzi ORS Thanzi ORS
  - d) Ndowa Bucket
  - e) Palibe None of the above
- 62) Kodi mumasunga madzi anu akumwa mu ndowa yomwe mudalandira muphukusi la ukhondo? **Yes**  
Do you store drinking water in the bucket in the hygiene kit? **No**
- 63) Kodi ndowa yomwe mudalandira muphukusi la ukhondo imagwiranso ntchito zina? **Yes**  
Do you use the bucket in the hygiene kit for anything else besides to store drinking water? **No → Go to 65)**
- 64) **If YES**, imagwiranso ntchito yanji? (**Do not read. Circle ALL that apply**) What else do you use the bucket for?
- a) Water used for cooking
  - b) Water used for washing hands
  - c) Water used for bathing

d) Other (Specify) \_\_\_\_\_

- 65) Kodi munagwiritsa ntchito WaterGuard yemwe mudalandira kuchipatala poteteza madzi anu akumwa? **Yes**  
Did you use the free *WaterGuard* from the hygiene kit to treat drinking water? **No**  
**DK**
- 66) Kodi munakalandiranso mabotolo ena aulere a WaterGuard kuchipatala mutapatsidwa phukusi la ukhondo?  
Did you receive any free refill bottles of *WaterGuard* at the health facility after you received the hygiene kit?  
**Yes**  
**No → Go to 69)**  
**DK → Go to 69)**
- 67) Kodi munalandira ma botolo angati aulere a WaterGuard ku chipatala? (**Do not read. Circle ONLY ONE**)  
How many free bottles of *WaterGuard* did you receive in total from the health centre?  
a) 1  
b) 2  
c) 3  
d) 4  
e) 5 or more  
f) DK
- 68) Ndi liti lomwe munalandira botolo lomaliza laulere la WaterGuard ku chipatala? (**Do not read. Circle ONE**) When was the last time you received a free bottle of *WaterGuard* from the health facility?  
a) <1 month ago  
b) 1-2 months ago  
c) >2 months ago  
d) DK
- 69) Kodi munayamba kugula WaterGuard mutatha kulandira yense yomwe mumayenera kulandira kuchipatala? Did you purchase *WaterGuard* after you finished all of the free bottles from the health centre?  
**Yes**  
**No → Go to 71)**  
**DK → Go to 71)**  
**N/A → Go to 71)**
- 70) Kodi mwagulapo ma botolo a WaterGuard angati atatha waulere yemwe mudalandira kuchipatala?  
(**Do not read. Circle ONLY ONE**) How many bottles of *WaterGuard* have you purchased since you finished all of the free bottles from the clinic?  
a) One  
b) Two  
c) More than two

## HOME ENVIRONMENTAL ASSESSMENT

For questions below, record **OBSERVATIONS** made by the enumerator.

- 71) Ndingawone nawo chimbudzi chomwe mumagwiritsa ntchito pa khomo pano?  
May I see the toilet facility that household members usually use? (**Record observation. Circle ONE**)  
a) No facilities  
b) Traditional pit latrine  
c) Improved latrine  
d) Flush toilet  
e) Other (Specify) \_\_\_\_\_
- 72) Kodi muli ndi sopo nyumba muno? **If YES**, Ndingawone nawo? **Yes** **No**  
Do you have soap in the house? May I see it? (**Record observation**)
- 73) Kodi muli ndi la WaterGuard? **If YES**, Ndingawone nawo? **Yes** **No**  
Is there a bottle of *WaterGuard*? May I see it? (**Record observation**)

74) Mungandionetse kumene mumasunga madzi anu akumwa? *May I see where you store your drinking water?*  
**(Record the type of container(s) that drinking water is stored in. Circle ALL that apply)**

- a) Hygiene kit bucket (blue bucket with lid and tap)
- b) Other bucket
- c) Clay pot
- d) Jerry can
- e) Cooking pot
- f) Plastic bottles
- g) Water tank/ barrel/ drum
- h) Other (*Specify*) \_\_\_\_\_
- i) No water storage container → **Go to 78)**

75) Is the water storage container covered with a lid? **(Record observation)**    **Yes**        **No**

76) Is there drinking water in the water storage container? **(Record observation)**    **Yes**    **No → Go to 78)**

77) Kodi ndingayeze nawo madziwa? *May I take a sample of this water?* **Record result of chlorine test:**

- a) Negative (no color change)
- b) Positive (pink color)
- c) Test refused

78) Kodi mumasamba mmanja nthawi ziti? **(Do not read. Circle ALL that apply.)** When do you wash your hands?

- a) After using the toilet
- b) Before eating
- c) After eating
- d) Before cooking
- e) After nappy change
- f) When they are dirty
- g) Other (*Specify*) \_\_\_\_\_

79) Tikufuna tionerereko m`mene mumasambira mmanja? **(Please circle yes or no after each):**

We would now like to watch you demonstrate hand washing.

- |  |            |           |
|--|------------|-----------|
| a) Uses soap   | <b>Yes</b> | <b>No</b> |
| b) Lathers hands (completely covered with soap)          | <b>Yes</b> | <b>No</b> |
| c) Wipes hands dry with a clean towel or air dries hands | <b>Yes</b> | <b>No</b> |

**Zikomo kwambiri!!!! Thank you very much for your time.**

**(PLEASE REVIEW EACH PAGE OF THE QUESTIONNAIRE CAREFULLY AND MAKE SURE ALL QUESTIONS ARE ANSWERED BEFORE LEAVING THE HOME).**

QUESTIONNAIRE REVIEWED \_\_\_\_\_ ENUMERATOR \_\_\_\_\_ SUPERVISOR



## KNOWLEDGE ABOUT DIARRHEA

- 14) Kodi chimene chimayambitsa matenda otsekula mmimba ndi chiyani? (**Do not read. Circle ALL that apply.**) What causes diarrhea?
- Drinking bad water
  - Eating bad food
  - Unwashed fruit/ vegetables
  - Flies/ insects
  - Poor hygiene/ not washing hands
  - Poor sanitation/ lack of latrine
  - Other (*Specify*) \_\_\_\_\_
  - DK
- 15) Kodi pakhomu panu mukadwala matenda otsegula mmimba mumalandira chithandizo chotani? (**Do not read. Circle ALL that apply.**) At home, how do you treat diarrhea in yourself or your family members?
- Do not treat
  - Increase liquid intake
  - Decrease liquid intake
  - Decrease food intake
  - Use Thanzi oral rehydration salt packets (ORS)
  - Use sugar-salt solution
  - Pill or syrup
  - Injection
  - Go to the hospital or clinic
  - Home remedy/ traditional medicine (*Specify*) \_\_\_\_\_
  - Other (*Specify*) \_\_\_\_\_
  - DK
- 16) Kodi mungadziteteze bwanji ku matenda otsegula mmimba? (**Do not read. Circle ALL that apply.**) How can you prevent you or your family members from getting diarrhea?
- Cannot prevent
  - Wash hands more often/ improve hygiene
  - Cook food thoroughly
  - Cover food
  - Boil or treat water
  - Wash vegetables and fruit
  - Clean cooking utensils/ vessels
  - Good sanitation/ use latrines
  - Other (*Specify*) \_\_\_\_\_
  - DK

## WATER-HANDLING PRACTICES

- 17) Kodi madzi akumwa mumatunga kuti? (**Do not read. Circle ONLY ONE. If more than one answer is given, please ask for the MAIN one and circle only one.**) What is your main source of water for drinking at home?
- Tap inside the house
  - A piped public tap (kiosk)
  - Water piped into a yard or plot
  - Water from protected borehole/ well
  - Open well in residence (not a borehole)
  - Open community well (a traditional public well)
  - Protected spring
  - Open spring
  - River, dam, or surface water for drinking
  - Other (*Specify*) \_\_\_\_\_
- 18) Kodi mukuganiza kuti madzi omwe mumamwawa ndi abwino kumwa musanaateteze? Yes  
Do you think the drinking water from your main source is safe to drink without treating? No  
DK
- 19) Kodi mumasunga madzi akumwa? Yes  
Do you store your drinking water? No → Go to 22)  
DK → Go to 22)

20) **If YES**, Kodi ndi chiwiya chanji chomwe mumasungira madzi akumwa? (**Do not read. Circle ONE**)

How do you usually store your drinking water?

- a) Bucket
- b) Clay pot
- c) Jerry can
- d) Cooking pot
- e) Plastic bottles
- f) Water tank/ barrel
- g) Other (*Specify*) \_\_\_\_\_

21) Kodi madzi anu mumatunga bwanji kuchokera mmene mumasungiramo madzi? (**Do not read. Circle ONE.**) How do you remove water from your container?

- a) Scoop out with ladle, cup, or hand
- b) Pour
- c) Tap
- d) Other (*Specify*) \_\_\_\_\_

## WATER TREATMENT

22) Kodi madzi akumwa mumawateteza kuti akhale aukhondo?

Do you protect your drinking water to make it safe?

Yes

No → Go to 25)

DK → Go to 25)

23) **If YES**, Kodi madzi anu kuti akhale aukhodo mumawatani? (**Do not read. Circle ALL that apply**)

What do you do to make your drinking water safe?

- a) Boil
- b) Filter
- c) Let settle
- d) Treat with *WaterGuard* (liquid)
- e) Treat with *WaterGuard* Wa Ufa
- f) Chlorine stock solution (i.e, from HSA or health facility)
- g) Cover container with lid
- h) Other (*Specify*) \_\_\_\_\_

24) Ndiliti lomwe munawateteza madzi anu? (**Do not read. Circle ONLY ONE**)

When did you last treat your drinking water?

- a) Today
- b) Yesterday
- c) 2 or more days ago
- d) DK

## KNOWLEDGE ABOUT WATERGUARD

25) Kodi munamvapo za *WaterGuard*?

Yes

Have you heard of *WaterGuard*?

No → Go to 43)

26) Kodi munayamba mwaphunzitsidwa za m'mene mungagwiritsire ntchito *WaterGuard*?

Has someone taught you how to use *WaterGuard*?

Yes

No → Go to 28)

DK → Go to 28)

27) Kodi ndi ndani kapena kudzera njira iti imene inakupatsani chikhulupiliro kuti muthe kugwiritsa ntchito *WaterGuard*? (**Do not read. Circle ONLY ONE**) Which person or source gave you the most confidence to treat your drinking water with *WaterGuard*?

- a) Health care provider in the health centre (nurse, HSA, EHO, clinical officer)
- b) HSA visiting the home
- c) Friend/ Neighbor/ Relative
- d) TBA (Traditional Birth Attendant)
- e) Shop owner
- f) Radio advertisement
- g) Brochure
- h) Other (*Specify*) \_\_\_\_\_
- i) No one gave me confidence

Clinic ID \_\_\_\_\_

Participant ID \_\_\_\_\_

Friend/ relative \_\_\_\_\_

- 28) Kodi mumayika zivindikiro zaboloto la WaterGuard zingati m'ndowa ya m'madzi akumwa? \_\_\_\_\_ caps  
How many caps of *Waterguard* should be added to a pail of water? (**Circle DK if "I don't know"**) DK
- 29) Kodi tingadikilire nthawi yayitali bwanji tisanayambe kumwa madzi amene tathira WaterGuard? (**Do not read. Circle ONLY ONE.**) How long should someone wait to drink water after treating it with *WaterGuard*?  
a) Immediately  
b) Less than 30 minutes (but not immediately)  
c) 30 minutes or more  
d) DK
- 30) Kodi mumadziwa komwe mungagule WaterGuard? Yes  
Do you know where you can buy *WaterGuard*? No  
DK
- 31) **If YES**, Tchulani mtengo wa WaterGuard? How much does it cost? \_\_\_\_\_ kwacha  
DK
- 32) Kodi mudamvaponso kuti za WaterGuard? Where did you hear about *WaterGuard*? (**Do not read. Circle ALL that apply.**)  
a) Radio  
b) Television  
c) Newspaper  
d) Billboard  
e) Flyer or brochure  
f) HSA visiting the home  
g) Community meeting  
h) Village leader/ headman  
i) Friend/neighbor/relative  
j) Local shop (in the villages)  
k) Other (Specify) \_\_\_\_\_  
l) In the health centre
- 33) Kodi muyamba mwamvapo za WaterGuard kuchokera kwa anzanu omwe adalandira ndowa kuchipatala? Yes  
Did you hear about *WaterGuard* from your friend enrolled in the hygiene program No  
at the health centre, \_\_\_\_\_ (insert name of pregnant woman)? DK
- 34) Mutamva za WaterGuard, kodi munayamba mwauzapo anzanu kapena achibale za WaterGuard? Yes  
Did you share any information that you heard about *WaterGuard* with any other friends or family members? No  
DK

## **WATERGUARD USE**

- 35) Kodi munagwiritsako ntchito WaterGuard? **Yes → Go to 37)**  
Have you ever used *WaterGuard*? No  
DK
- 36) (**If NO to 35**), Ndi chifukwa chiyani simunagwiritseko ntchito WaterGuard? (**Do not read. Circle ALL that apply.**)  
Why have you not used *WaterGuard*?  
a) Can't afford → **Go to 43)**  
b) Don't need → **Go to 43)**  
c) Fear of adding chemicals to water → **Go to 43)**  
d) Water is clean → **Go to 43)**  
e) Don't like the smell → **Go to 43)**  
f) Not available → **Go to 43)**  
g) Use chlorine stock solution (i.e., from health facility or HSA) → **Go to 43)**  
h) Don't know how to use → **Go to 43)**  
i) Other (Specify) \_\_\_\_\_ → **Go to 43)**  
**Go to 43)**

- 37) Kodi munampeza bwanji WaterGuard? (**Do not read. Circle all that apply. If the participant answers, "I buy it," please ask where**). How do you obtain *WaterGuard*?
- HSA/ nurse/ clinic or health facility
  - Friend/ relative
  - Local shop (in the villages)
  - Retail shop (in the trading center)
  - Pharmacist
  - Other (*Specify*) \_\_\_\_\_
- 38) Pa chaka, kodi pali nthawi zina zomwe inu mumawona kuti ndi koyenera kugwiritsa ntchito WaterGuard? (**Do not read. Circle ALL that apply**). Are there times of the year or certain occasions when you are more likely to use *WaterGuard*?
- Every day
  - Special occasions
  - For guests or visitors
  - During the rainy season
  - During cholera outbreaks
  - Other (*Specify*) \_\_\_\_\_
- 39) Mwachulapo WaterGuard? **Yes**  
Have you purchased *WaterGuard*? **No → Go to 41**  
**DK → Go to 41**
- 40) **If YES**, Ndimabotolo angati amene mwachulapo mu miyezi six yapitayi?  
How many bottles of *WaterGuard* have you purchased in the last six months?
- One
  - Two
  - Three
  - More than three
- 41) Kodi ndi nthawi yomaliza iti yomwe inu munagwiritsapo ntchito WaterGuard kuteteza madzi anu akumwa? (**Do not read. Circle ONLY ONE**) When was the last time you used *WaterGuard* to treat your drinking water?
- Today → **Go to 43**
  - Yesterday → **Go to 43**
  - This week → **Go to 43**
  - More than one week ago, but this month → **Go to 43**
  - More than one month ago → **Go to 42**
  - DK → **Go to 42**
- 42) Ndi chifukwa chiani munasiya kugwiritsa ntchito WaterGuard? (**Do not read. Circle ALL that apply**). Why did you stop using *WaterGuard*?
- Can't afford
  - Don't need
  - Fear of adding chemicals to water
  - Water is clean
  - Don't like the smell
  - Not available
  - Use chlorine stock solution
  - Don't know how to use
  - Other (*Specify*) \_\_\_\_\_

## HOME ENVIRONMENTAL ASSESSMENT

For questions below, record OBSERVATIONS made by the interviewer.

Clinic ID \_\_\_\_\_

Participant ID \_\_\_\_\_

Friend/ relative

43) Ndingawone nawo chimbudzi chomwe mumagwiritsa ntchito pa khomo pano?

May I see the toilet facility that household members usually use? (**Record observation. Circle ONE**)

- a) No facilities
- b) Traditional pit latrine
- c) Improved latrine
- d) Flush toilet
- e) Other (*Specify*) \_\_\_\_\_

44) Kodi muli ndi sopo nyumba muno? **If YES, Ndingawone nawo?**                      **Yes**                      **No**

Do you have soap in the house? May I see the soap? (**Record observation**)

45) Kodi muli ndi la WaterGuard? **If YES, Ndingawone nawo?**                      **Yes**                      **No**

Is there a bottle of *WaterGuard*? May I see it? (**Record observation**)

46) Mungandionetse kumene mumasunga madzi anu akumwa? May I see where you store your drinking water? (**Record the type of container(s) that drinking water is stored in. Circle ALL that apply**)

- a) Bucket
- b) Clay pot
- c) Jerry can
- d) Cooking pot
- e) Plastic bottles
- f) Water tank/ barrel
- g) Other (*Specify*) \_\_\_\_\_
- h) No water storage container → **Go to 50**

47) Is the drinking water container covered with a lid? (**Record observation**)    **Yes**                      **No**

48) Is there drinking water in the water storage container? (**Record observation**)    **Yes**                      **No → Go to 50**

49) Kodi ndingayeze nawo madziwa? May I take a sample of this water? **Record result of chlorine test:**

- a) Negative (no color change)
- b) Positive (pink color)
- c) Test refused
- d) Water not present in storage container

50) Kodi mumasamba mmanja nthawi yanji? (**Do not read. Circle ALL that apply.**) When do you wash your hands?

- a) After using the toilet
- b) Before eating
- c) After eating
- d) Before cooking
- e) After nappy change
- f) When they are dirty
- g) Other (*Specify*) \_\_\_\_\_

51) Tikufuna tionerereko m`mene mumasambira mmanja? (**Please circle yes or no after each**):

We would now like to watch you demonstrate hand washing.

- |  |            |           |
|--|------------|-----------|
| a) Uses soap   | <b>Yes</b> | <b>No</b> |
| b) Lathers hands (completely covered with soap)          | <b>Yes</b> | <b>No</b> |
| c) Wipes hands dry with a clean towel or air dries hands | <b>Yes</b> | <b>No</b> |

**Zikomo kwambiri!!!! Thank you very much for your time.**

**(PLEASE REVIEW EACH PAGE OF THE QUESTIONNAIRE CAREFULLY AND MAKE SURE ALL QUESTIONS ARE ANSWERED BEFORE LEAVING THE HOME).**

QUESTIONNAIRE REVIEWED \_\_\_\_\_ ENUMERATOR

\_\_\_\_\_ SUPERVISOR