Water, Water Everywhere, but Not a [Safe] Drop to Drink!
Achieving Household Point-of-Use Water Treatment in Amazonian Peru

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ABSTRACT

The USAID-funded Healthy Communities and Municipalities (HCM) Project, implemented by Management Sciences for Health (MSH), helps families and communities in seven Amazonian regions incorporate preventative health behaviors into their lives. During the initial phase of the HCM Project, communities carried out a participatory process to identify their own priorities for improvement, and access to safe water was consistently identified as one of the top three needs. MSH partnered with the USAID Hygiene Improvement Project (HIP) to develop a program to generate behavior change at the household level that would lead to point-of-use water treatment through chlorination, solar disinfection, or boiling. A pilot was carried out in the Curimaná District of the Ucayali Region of Peru and then scaled up to six additional regions.

Research was conducted to test the water quality from the various water sources in the communities and within households. All the water sources were found to be contaminated at levels dangerous for consumption. Using this data and the data from additional behavioral research, water treatment protocols were designed, an intervention planned, and training and user materials developed. Master trainers, who were members of local neighborhood councils, district level government, and health post staff, received intensive training to increase their competencies as behavior change agents regarding water, sanitation, and hygiene behaviors and to ensure sustainability beyond the project lifespan.

Success of the intervention was evidenced by a significant positive shift, from 49.9 percent to 60 percent, in the key indicator of number of children under the age of two who are consuming safe water, which was measured between the second semester of 2007 and the first semester of 2008.

KEYWORDS

Point-of-use treatment, household chlorination, SODIS, boiling, disinfection, materials development, IEC, training, community outreach, behavior change

INTRODUCTION

HCM's objective is to improve maternal, child, and perinatal health in communities that have signed coca-eradication agreements in seven regions of Peru. To achieve increases in health

indicators, the HCM program focuses on improving "health determinants" (access to clean water, latrines, housing conditions, children's parks, etc.) within the participating communities.
During the initial phases of the HCM Project, communities identified their own priorities for improvement through a participatory process. Access to clean water was consistently named as one of the top three community concerns. However, the HCM Project did not have funds to address infrastructure issues relating to water access or quality, so MSH partnered with USAID-funded HIP, managed by the Academy for Educational Development (in collaboration with The Manoff Group, ARD Inc., and the IRC International Water and Sanitation Centre, to develop a simple, low-cost intervention to help people improve the bacteriological quality of their consumable water. The focus of the HCM/HIP program was to generate behavior change at the household level that would lead to point-of-use (POU) water treatment through chlorination, solar disinfection, and/or boiling.

MSH/HIP chose to initially focus its activities on one pilot district, the Curimaná District in the Ucayali Region, to develop, test, and improve the intervention before taking it to scale in all seven regions covered by the HCM Project. The District of Curimaná is located about two and a half hours away from the regional capital of Pucallpa. It comprises municipality of Curimaná and 29 rural communities located at varying distances from the municipality. The majority of the communities are accessible by road, but others are only accessible by boat or foot. Many of the inhabitants migrated to the area less than 20 years ago and live primarily by farming the rich soil.

Above: Typical houses in Curimaná District.

After conducting formative behavioral and water quality research, an MSH/HIP team, with assistance from the U.S. Centers for Disease Control and Prevention (CDC), developed appropriate water treatment, storage, and handling protocols for the Amazon Region in Peru. These protocols were incorporated into a series of interactive activities to encourage family members to engage in desirable POU water treatment, storage, and handling behaviors. The activities cover the contamination/diarrhea cycle; use of chlorination, SODIS, or boiling to treat drinking and cooking water; steps to prevent contamination of wells; and proper hand washing and feces disposal. A training program was developed to teach community outreach workers how to work with families and track their behavior change. Training and reminder materials for

household members were developed to reinforce the key concepts.

Emphasis was placed on identifying small doable steps around POU water treatment, storage, and handling behaviors so that families unable to implement the "ideal" behaviors could still take incremental steps that they considered feasible, which would still lead to personal and public health improvement, even though they were not ideal practices. Outreach workers have successfully used a diagnostic tool that was developed to help them identify current household behaviors and negotiate improved small doable behaviors that can realistically be accomplished within the household context.

METHODOLOGY

In order to develop the HCM/HIP intervention, it was necessary to:

- Conduct research to identify the water quality and household behavioral issues that would drive the implementation design
- Develop an intervention design based on the findings of the research
- Produce the materials (training manuals, community outreach worker reference guide, household reminder materials, monitoring/tracking tools) that would be used in the implementation phase
- Conduct trainings to develop competencies of outreach workers who are charged with working at the community and household level
- Mobilize the community by conducting group trainings on the behavioral interventions regarding water treatment, hand washing, and feces disposal

Research and Water Treatment Protocol Development

In October 2006, two consultants, an engineer and a public health specialist, conducted an assessment that consisted of:

- Observations and interviews on household knowledge, attitudes, and practices around water collection, handling, storage, treatment, and use
- Quantitative fecal bacteriological testing of source and household (HH) waters
- Water quality parameters related to the design of a HH water treatment (disinfection) protocol. These parameters included pH, turbidity (visible as well as measured by a turbidimeter), conductivity, chlorine demand of waters (using CDC testing protocol), and chlorine content of locally available chlorine products

Findings from this assessment indicated that communities in the District of Curimaná relied on a variety of drinking water sources. Thirteen communities were served by potable water systems, with varying levels of service. Households in these 13 communities, like HHs in the other 16 communities of the district, collected water for HH uses from the Aguaytía River, small streams, formally constructed "artisan" wells that can serve neighborhoods or individual households, informal hand-dug wells that can serve neighborhoods or single HHs, and to a lesser extent rainwater harvesting.


Above: Examples of local water sources in the Curimaná District. Although water from these sources has a low turbidity, it may contain dissolved organic material that can affect efficacy of disinfection by chlorination.

Water was collected, stored, and used by HHs with minimal attention paid to maintaining water quality. Sources (wells, rivers, lakes, etc.) were contaminated for a number of reasons and further contamination of water likely occurred during collection, handling, storage, and use. Thus, it was not surprising to find that all water sources, and all water sampled in HHs, showed signs of fecal contamination with high levels of fecal coliform bacteria—all of which were at levels of "high risk" to "very high risk" according to World Health Organization standards.

Water sources were observed to lack fundamental infrastructure to prevent contamination.
Water treatment was typically absent or otherwise rudimentary and allowed for recontamination.
Observed HH treatment practices were not based on empirically developed protocols.
People were aware of the role of water in human health and that water can be a disease carrier and took measures (treated water) to address aesthetic issues—i.e., turbidity, taste.


Above: Examples of informal hand-dug wells common in the Curimaná District.

Based on the findings that indicated source contamination, documentation of the significant risk of contamination and recontamination of boiled water in the HH, and observations of HH economic status and absorptive capacity, a HH water treatment system using a chlorine-based approach was recommended. This presented a unique challenge since a chlorination product

(such as WaterGuard, Aquatabs, PUR, etc.) was not available in Peru. Therefore, the project team, with the assistance of the CDC, designed a chlorination protocol using available household chlorine bleach products.

Above: Bleaches, such as Clorox, Sapolio, and Reluciente, are manufactured in Lima and sold in stores in Curimaná.

The chlorine demand study informed the design of chlorine dosage protocols for water from different sources and of varying quality (turbidity). Chlorine treatment protocols were developed for four water source/turbidity scenarios:

- All waters from surface sources except those with very high turbidity
- Low turbidity waters from groundwater sources
- Turbid waters from groundwater sources
- High turbidity waters from any source (and accompanying protocol for turbidity analysis and turbidity removal)

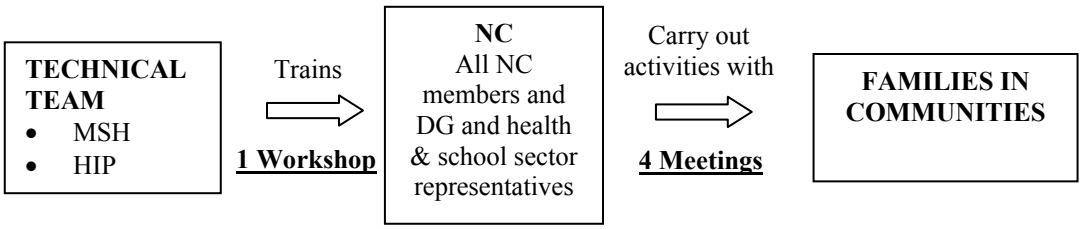
These chlorine treatment protocols also had to take into consideration the variability in the quality (chlorine concentration) of the locally available chlorine source—HH bleach. Three brands of bleach are sold in Curimaná: Clorox, Sapolio, and Reluciente. The chlorine content of each brand was analyzed to confirm the reliability of the percent concentration printed on the label of each product; only the Clorox and Reluciente brands had chlorine concentrations consistent with the printed concentration.

In order to give households that could not/would not chlorinate their water alternatives for water treatment, the options of boiling and solar water disinfection (SODIS) were also incorporated into the intervention. To enhance the effectiveness of the chlorine-based treatment system and to minimize the risk of recontaminating water in the HH, the project integrated improvements in water collection, storage, and handling, as well as actions to better protect and maintain water sources.

Intervention Design

The data gathered during the research phase informed the program design, which focused on incorporating individuals from the district, community, and household level. Members of the district level government (DG), volunteers from the neighborhood council (NC or *Juntas Vecinales Comunales*), and staff from health posts and schools were recruited to be "outreach workers." During a one-day workshop, the MSH/HIP technical team trained the outreach workers in a series of activities to promote change in behaviors (point-of-use water treatment, hand washing, and feces disposal) that lead to increased risk of contracting diarrhea. The outreach workers then engaged with groups and individual families at the community level to repeat the behavior change activities during four different meetings.

Figure 1 - Intervention Design



The outreach workers also monitored changes in behavior and relayed that data to the authorities at the district level, who track changes across all the communities within the district.

Materials Development

To train the outreach workers and provide them with tools that they could use when working with families in the community, the MSH/HIP team developed a series of materials that included a training manual, a reference guide, wall hangings/large banners, and reminder brochures for families.

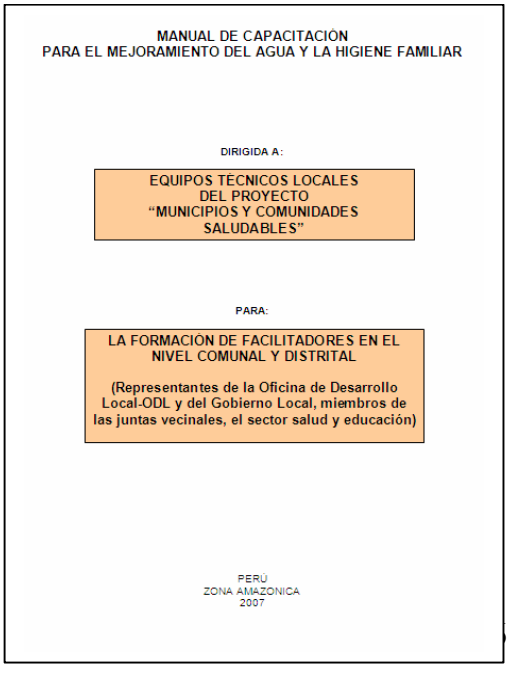
Training Manual for Household Improvement in Water, Sanitation, and Hygiene

This training manual was developed to train local community outreach staff or trainers on:

- How to implement a series of group activities (which take a total of four hours) at the community level to reduce diarrhea
- How to train other people so they can implement the activities

Once participants have completed the training they are be able to:

- Describe the contamination cycle and how to break this cycle by treating water at home, washing hands, and properly disposing of feces


MANUAL DE CAPACITACIÓN
PARA EL MEJORAMIENTO DEL AGUA Y LA HIGIENE FAMILIAR

DIRIGIDA A:

EQUIPOS TECNICOS LOCALES DEL PROYECTO "MUNICIPIOS Y COMUNIDADES SALUDABLES"

PARA:

LA FORMACIÓN DE FACILITADORES EN EL NIVEL COMUNAL Y DISTRITAL

(Representantes de la Oficina de Desarrollo Local-ODL y del Gobierno Local, miembros de las juntas vecinales, el sector salud y educación)

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ZONA AMAZONICA
2007

- Implement activities with community members to help them change their behavior

Above: Explaining sanitation behavior to reduce diarrhea.

- Use diagnostic and data tracking tools to measure behavior change at the household and community level

The training workshop for outreach workers takes one day and incorporates structured learning activities: presentations, group discussions, group work, role plays, and practical exercises. Participants are engaged through their active involvement in the exercises and through work in small groups. During the workshop, the outreach workers experience what it is like being a participant in the exercises they will later lead in the communities.

Community Outreach Workers' Reference Guide for Household Improvement in Water, Sanitation, and Hygiene

This reference guide is intended to be used by the outreach workers when working with community members to help them implement behavior change related to water treatment/storage/handling, hand washing, and feces disposal in order to reduce diarrhea. The guide is divided into five chapters addressing the following topics:

- **Questions and answers**: This section provides basic information on diarrhea, water treatment (chlorination, boiling, SODIS), hand washing, and feces disposal.
- **Activities**: This chapter provides detailed instructions on how to carry out interactive activities with community members on the contamination cycle, water treatment (chlorination, boiling, and SODIS),

hand washing, and feces disposal. Each activity has step-by-step instructions and supporting materials needed to meet activity objectives. (These activities are identical to the activities implemented during the TOT.)

- **Diagnostic Tool, Data Tracking Instruments, and Information System**: This section describes how to use a tool ("Assessment Tool: Household Water") to determine current water treatment/storage/handling/use behaviors in a household and to negotiate improved behaviors. This chapter also describes how to use three additional tools to monitor behavior changes at the household and community level. It also includes information on how to turn the numerical data into bar graphs to share with the community members to keep them informed about on their progress.
- **Tool Box**: This chapter provides information on how to manage/lead a group during a training or group activity, improve interpersonal communication skills, and negotiate adoption of improved behaviors.

Wall Hangings/Large Banners

These materials are large enough to be hung on a wall and are used during the training of outreach workers and when working with a group or family in the community. The 14 wall hangings/banners summarize key information about water treatment/storage/handling, hand washing and feces disposal, and data monitoring.

The wall hangings/large banners cover the following topics:

For **contamination cycle/diarrhea**:

- Contamination cycle graphic

For **water** use/management/source protection:

- Chlorination (steps for chlorinating water using protocol developed specifically for Peru)
- Boiling
- SODIS
- How to protect our water (i.e., steps to prevent recontamination through proper transportation, serving, and storage)
- How to protect your well
- Graphic of water quality testing results for Curimaná, Peru

For **hand washing**:

- How to wash your hands
- When to wash your hands

For **feces management**:

- Proper feces disposal

For **data gathering/monitoring:**

- "Assessment Tool: Household Water" —This diagnostic tool is used to assess how water is treated, stored, and managed in each household and to negotiate new, "improved" behaviors.
- "Family Data Tracking Sheet" —This individual household monitoring tool is used to track household-level data regarding current behavior and improved behavior on how water is treated, stored, and managed. Each outreach worker uses this tool to establish a baseline and track behavior changes for all of the families he or she is responsible for in the community. This wall hanging/banner is used ONLY when training trainers or community outreach workers. It is NOT used during the activities with the families.
- "Data Consolidation Sheet"—This community-level monitoring tool is used to consolidate data gathered by all of the outreach workers in one community. Each row in the data consolidation sheet is filled in by translating the data from the family data tracking sheets that outreach workers have recorded with household-level data. This wall hanging/banner is used ONLY when training trainers or community outreach workers. It is NOT used during the activities with the families.
- "Bar Graph" —The bar graph generator tool helps the outreach worker translate the numerical data from the data consolidation sheet into a bar graph that can be shared with community members so that they can see behavior change progress at a community level.

Reminder Brochures

These small, brochure-sized materials can be given to each family to help them remember the concepts learned during each activity. The brochures cover the same topics listed under "wall hangings/large banners." (However, the reminder brochures do not include sections on "data gathering/monitoring.") A wall display board can also be given to each family so that they can prominently display their reminder materials and help reduce the risk that they are damaged or lost.

Interactive Game

This interactive game is the first activity carried out with a group of community members. The objective of the game is to generate discussion and an exchange of ideas on how our environment can get contaminated with feces and the connection between fecal contamination and diarrhea. Fourteen large "flash cards" are used during the game and participants are asked to explain why they believe that images on the flashcards may or may not represent a risk for getting diarrhea.

Above: One of the interactive "flash cards" to discuss diarrhea risk.

Training

The initial concept was a "cascade" training design where the MSH technical team would train a group of master trainers in each district, and the master trainers would, in turn, (as the first level of the cascade) train members of the neighborhood councils. The members of the neighborhood councils would then work with family members (either in groups or individually) in the community. This was considered the second level of the cascade.

However, when this model was tested in the pilot, it was clear that the quality of the trainings was not maintained by the time it reached the family members (the second level of the cascade). The MSH/HIP team attributed this unevenness in the training to several factors:

- Some of the candidates that were selected by the community/local government to be master trainers were not necessarily "natural trainers," while others were clearly instinctual trainers.
- The job responsibilities of the individuals who came to the TOT often did not include training. Some participants were the staff of the health post, some were teachers, and some were volunteers that had been selected to be members of their neighborhood council, so they did not necessarily have the skill set to be good trainers.
- The amount of time available to train the master trainers was so limited that it was hard to build the "training" competencies of the participants in addition to covering all the other essential information about water, sanitation, and hygiene and the activities they were to replicate.

To solve the problem of "training quality degradation" at the community/family level, the MSH/HIP team decided that in each district it would hold the TOT with whatever candidates the community/district level government indicated. However, rather than having all the TOT participants roll out the activities at the community level, only TOT participants who had excelled in the training were asked to directly train the families in their communities. This eliminated the intermediary step of having the master trainers train the remaining members of the Juntas Vecinales (who in turn would train the families).

MSH staff were also present during the initial trainings implemented by each of the selected master trainers to continue to provide support and ensure that accurate technical information was provided.

Community Mobilization

The master trainers (members of the neighborhood councils/Juntas Vecinales Comunales) who were trained by the MSH technical team were responsible for implementing the program with families in the communities.

To initiate activities in the communities, the master trainers invited representatives of each family in the community to a four-hour workshop. Most communities have a community building (managed by the neighborhood council) that is large enough to hold community gatherings. The workshops were generally held in these community buildings with an average

attendance of 35 participants. After the initial workshops, the family representatives were asked to return once a month for three months for additional meetings that lasted no more than one hour and were focused on evaluating the families' behavior change progress.

Preparation Prior to the Workshops with the Family Representatives
Prior to the workshop, the master trainers were responsible for gathering all of the materials necessary to conduct the activities, including:

- One copy of the reference guide
- One set of wall hangings/large banners
- One set of the 14 illustrations for the interactive game
- One set of bar graphs (five sheets total)
- One set of 10 household reminder brochures per family attending the training
- One display board per family attending the training
- All the items necessary to carry out the workshop activities (the items are listed under the heading "Materials" at the beginning of the activity description in "Section 2, Activities" of the reference guide)

During the Training
During the community workshop, the master trainer led the family representatives through the same activities that were conducted during the TOT. "Section 2, Activities" of the reference guide provides very detailed instructions on how to organize and implement each of the activities and is intended as a support tool for the master trainer when he/she is leading a workshop. Each of the activities in the workshop takes between 15 to 50 minutes. When conducting community workshops, the master trainers provided support and guidance to one another to ensure that the activities were implemented as directed, which enriched the participatory process.
It is important to note that the communities were divided into sections and each member of the neighborhood council (Junta Vecinal Comunal) was responsible for the households in a particular section. The neighborhood council members worked with the same group of families over time on a variety of activities, which facilitated the monitoring of behavior change related to water, sanitation, and hand washing.

One of the pivotal moments during the community workshops was the division of participants into small subgroups made up of neighbors, led by the neighborhood council member that is responsible for that set of households. The small subgroups used the "Assessment Tool: Household Water" to review current practices for household water treatment, handling, storage, and use. The representatives of each household had a small version of the instrument (which is one of the household reminder brochures) and the neighborhood council leader had a larger, laminated version of the instrument, which is an appendix in the reference guide. The subgroup reviewed the instrument as a group and the individual household representatives marked their current household practices with an "X" on their brochure-sized version of the instrument.

The neighborhood council leader then met with each of the family representatives to review their current practices and motivate them to improve less desirable behaviors. (Information on how to negotiate commitments to improve behaviors is found in the reference guide and was practiced by the master trainer during the TOT.) The new, "improved" behaviors that family members want to implement were marked on the family's brochure-sized version of the instrument with a circle drawn around them. The neighborhood council member transcribed the data about each family's current practices and commitments to improved practices on the "Family Data Tracking Sheet."

At the conclusion of the small-group work, the neighborhood council member confirmed the next meeting date with the family representatives and reminded them to bring their household reminder brochure-sized version of the "Assessment Tool: Household Water" to update the information at the next meeting.

Immediately after concluding the community workshop, the neighborhood council leaders who were in charge of the subgroups met and selected a point person to transmit the data gathered through the "Assessment Tool: Household Water" to the local government. Each neighborhood council member shared his/her "Family Data Tracking Sheet" with the point person and his/her information was transferred onto the "Data Consolidation Sheet" (which can be found in the annexes of the reference guide). By the end of this meeting, all of the data gathered from the households was compiled onto the "Data Consolidation Sheet" and a copy was delivered to the local government so that it can track changes at the district level.

The data from the "Data Consolidation Sheet" were in numerical form, which can be difficult for community members to understand. By using the "Bar Graph" forms, this numerical data can be changed into a visual representation of the data. When the "Bar Graph" forms were shared with community members after each of the four meetings where data were gathered, they began to see the areas in which the community as a whole achieved improvements in behavior change and the places where they still needed to improve.

As mentioned above, the first meeting with the community was structured as a workshop where the community members were introduced to the key topics in water, sanitation, and hygiene, and it was the first opportunity to gather data on existing household practices and negotiate improved practices. In the second, third, and fourth meetings with community members, the focus was on gathering data on changes in behavior (through review of the "Assessment Tool: Household

Water" in the small subgroups) and negotiating additional changes in behaviors. After each of the second, third, and fourth meetings, the neighborhood council members followed the same process of filling in the "Family Data Tracking Sheet" and "Data Consolidation Sheet" and using the "Bar Graph" forms that were shared with the community members. Copies of the "Data Consolidation Sheets" were sent to the local government after each meeting.

Monitoring

The monitoring activities for the project have been carried out at multiple levels:

Data Gathering during Community Meetings

As described above, data were gathered from each household at four points in time, approximately one month apart. These data have been used not only to track each household's individual progress, but also conglomerated at the district level to see changes at a larger scale.

Neighborhood council members have been using the data from the household level to identify families that need more support because they are not changing their behaviors to meet their expectations/commitments. These families receive extra attention from the neighborhood council members to help them eliminate or reduce barriers that are preventing them from attaining their goals.

District-level governments are using the aggregate household data to identify which communities within their district are underachieving (compared to the other communities) and require additional support.

Reconfirmation of Data during Household Visits

Staff from the local health post and members of the local government's water, sanitation, and hygiene technical team have been charged with conducting household visits as part of their routine jobs. By using the "Assessment Tool: Household Water" during their visits, they reinforce the behaviors they are supposed to be helping families improve and provide observational data regarding behavior change reported during the community meetings (when they marked their household reminder brochure-size versions of the assessment tool).

Indicator Tracking

The overarching Healthy Communities and Municipalities Project tracks 12 maternal-child indicators, and one of the indicators is "consumption of safe water by children under two years of age." The indicators are measured approximately every six months, but the frequency is influenced by various factors, including the availability of the health post personnel and the volunteer work load of the neighborhood council members.

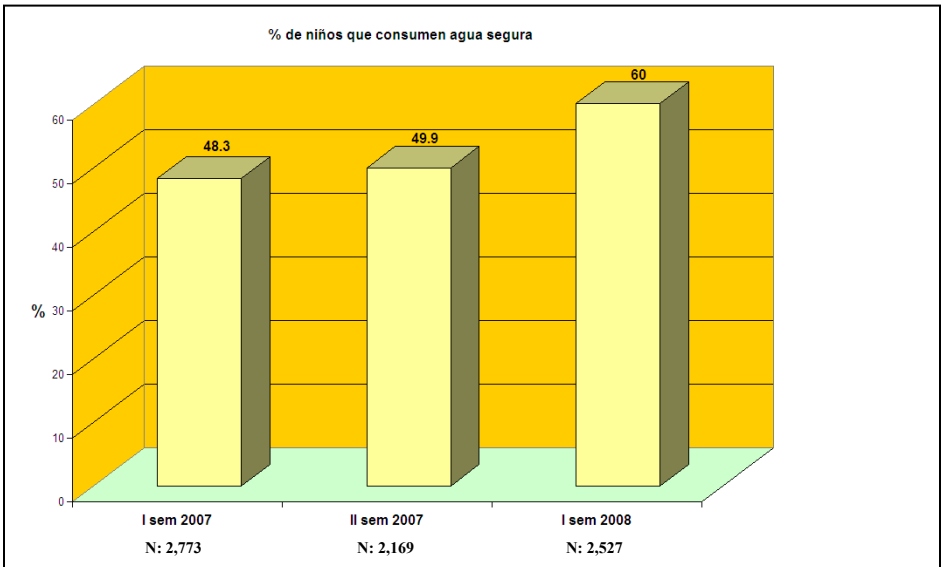
The people who take on the job of gathering the indicator data varies from community to community, but they include members of the neighborhood council (Juntas Vecinales Comunales), staff from the local health post, or members of the local government's water, sanitation, and hygiene technical team. While conducting household visits to gather indicator data, the researchers reinforce the messages that were given to the community workshop participants.

RESULTS

From the time the water, sanitation, and hygiene improvement intervention began in October 2007, until September 2008, 87 TOTs have been held with 1,964 participants (1,049 male; 915 female). Approximately 5,000 people in the seven regions where the HCM Project is active have been reached, and all of them have participated in the roll out of the activities in the community and received the household reminder brochures (on water treatment, storage, handling; hand washing; and feces disposal) and wall display boards.

Implementation of the MSH/HIP project has improved behaviors related to water treatment, consumption, and handling at the community level. Evidence of this improvement is substantiated by the positive change in the HCM Project's maternal-child health indicator that tracks "consumption of safe water by children under two years of age." This indicator has risen from 49.9 percent (at the end of the second semester in 2007) to 60 percent (at the end of the first semester in 2008) as shown in the following graph.

Figure 2 – Consumption of Safe Water by Children under Two



Fuente: *Ficha de autoevaluación comunal Madre – Niño- Sistema Gerencial de Información - MCS Perú*

In addition to changes in the key indicator, field staff report that families are referring to the household reminder brochures that are proudly displayed on the wall in most of the homes that have received the materials. MSH technical team staff members who visit the field once every month have confirmed that households are using the materials and have them prominently displayed.

Local government buy-in to the project is evidenced by district-level governments committing their own funds to support the project interventions. For example, the Padre Abad District chose to buy 1,000 20-liter "safe" water containers (buckets with a tight fitting lid and spigot) so that each family in the district could store and serve their water properly.

The project has generated enough "buzz" about its success that governments from regions outside of the project area (for example, in Junin and Pasco, in the Andean region) have approached the project to request technical assistance in adapting the household materials, assessment tools, and data tracking instruments for their regions and to train master trainers so that they can implement this strategy to reduce the number of acute cases of diarrhea. The regional governments requesting the assistance are funding the printing of the materials and the project implementation costs, while the HCM project is providing technical assistance.

CONCLUSIONS

Developing a program to achieve water treatment, handling, and storage behavior change at the household level can be accomplished, even in the absence of a commercial product, but it is necessary to carefully craft protocols that are appropriate for the region, develop a training program and materials that address local needs, and identify small doable actions that move families toward ideal behaviors. Repeated contact with families helps ensure sustainability of new behaviors until they become new cultural norms. Creating tools that help communities obtain feedback on their progress motivates continued behavior change.

It is indispensable to co-opt the local government's buy-in and participation in the project since the responsibility for improving access to safe water ultimately rests with the district officials. By empowering the government and community leaders and engaging them as full partners in the development and implementation of the activities, the project met the communities' needs.