Mid-term Survey and Evaluation of American Red Cross-Sponsored Community Reconstruction of Water and Sanitation

Honduras, Nicaragua, El Salvador, and Guatemala

Central American Operations

February 2001

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Introduction

The American Red Cross (ARC) has been active in relief and reconstruction in Central America in response to destruction caused by Hurricane Mitch during October 26 through November 1, 1998. This hurricane, one of the strongest, most devastating hurricanes to strike the region during the past 200 years, directly affected more than 3 million people. As part of their response to the adverse effects of the hurricane, ARC planned interventions to improve water and sanitation facilities in 110 affected communities in the region on the basis of existing resources and specific needs of each beneficiary community. ARC requested assistance from the Centers for Disease Control and Prevention (CDC) in November 1999 to evaluate the effectiveness of the ARC post-hurricane water and sanitation programs and hygiene-education activities in the affected communities.

Background

During a series of needs assessments performed by CDC for the ARC in January and February 1999, a severe need for water and sanitation was identified in communities in Honduras, Nicaragua, El Salvador, and Guatemala affected by Hurricane Mitch. These assessments showed that the availability of water and sanitation varied greatly from country to country, depending on the severity of the impact of the hurricane. In response to this identified need, ARC worked to provide water and sanitation to the affected communities. The goal of the interventions planned by ARC as part of the post-Hurricane Mitch reconstruction program was to improve the health of the people living in the affected areas by focusing on three objectives: 1) establish sustainable access to water, 2) provide sustainable access to sanitation services, and 3) provide community education in basic sanitation and hygiene practices.

ARC recognized the need to monitor and critically evaluate the progress of these new programs to increase their likelihood of meeting project goals and providing sustainable interventions. In November 1999, ARC requested assistance from CDC in evaluating the effectiveness of the ARC's post-hurricane water and sanitation and hygiene education activities in the affected communities where ARC is working. CDC and ARC planned a three-phase evaluation comprising 1) a survey of baseline water and sanitation resources and health indicators in February 2000 before the water and sanitation infrastructure and hygiene-education programs were in place, 2) a mid-term survey in February 2001 before the interventions were complete to evaluate how the conditions in each of the communities had advanced toward meeting the ultimate goals, and 3) a final survey in February 2002 to evaluate the effectiveness of the interventions in the communities after implementation.

Eight study areas from the four countries where ARC had implemented water and sanitation interventions were selected to participate in the evaluation. In each study area, the evaluation consisted of 1) a cross-sectional household survey to evaluate availability of water and sanitation services and related hygiene behaviors; 2) water analysis for microbial indicators of fecal contamination to provide a quantitative estimate of water quality; and 3) a community survey conducted with the local water board or local community leaders knowledgeable about the interventions. Additionally, 4 weeks of active surveillance for diarrhea was conducted in two of the study areas.

The United States Agency for International Development's (USAID's) Food and Nutrition Technical Assistance (FANTA) Project, "Water and Sanitation Indicator Measurement Guide" (Billig, et al., 1999) formed the primary basis of the evaluation. This guide was developed to establish consistent performance indicators for assessing and reporting the effect of water and sanitation interventions in developing countries. The performance indicators include impact indicators and monitoring indicators. The impact indicators assess the effect of the interventions on the behaviors and health status of the beneficiaries and include measures of disease burden, hygiene behavior, and maintenance and use of water supply and sanitation facilities. The monitoring indicators are used to evaluate the progress of the interventions in achieving programmatic goals. The baseline status of each of the communities with respect to the impact and monitoring indicators was evaluated during the baseline survey, and each community's progress toward achieving the goals established for each indicator was evaluated during the mid-term survey.

This report compares the results of the mid-term survey in February 2001 with those of the baseline survey in February 2000 to assess program effectiveness at an intermediate phase in project completion. Program effectiveness is measured by determining the improvement in the USAID performance indicators in each study area. The survey in February 2002 will be compared with both prior assessments to determine program effectiveness and likelihood that the interventions will be sustainable. Initial program sustainability will be measured as the ability of the communities to maintain the improvements in the USAID performance indicators from completion of the interventions to the final survey.

Baseline Survey-February 2000

The baseline survey was completed in seven study areas. The performance indicators outlined in the USAID guide were measured to determine the baseline status of diarrheal disease, water, sanitation, and hygiene behavior in each study area. Water samples were analyzed for microbial indicators of fecal contamination to provide a quantitative and qualitative baseline for water quality. The baseline survey is detailed in the report, "American Red Cross Post-Hurricane Mitch Reconstruction Water and Sanitation Baseline Survey in Honduras, Nicaragua, El Salvador, and Guatemala February 2000" (CDC, 2000). A summary of the results of the baseline survey is given below.

The availability of water was compared with the USAID guideline for this indicator (Billig, et al., 1999). At the baseline survey, fewer than 30% of households in each of the communities reported using 50 liters (L) of water per person per day (Lpd), the non-emergency water availability guideline set by USAID (Billig et al., 1999). Fewer than 10% of households in the communities in the study areas of Waspam, Nicaragua, La Ceiba, El Salvador and Chiquimula, Guatemala used 50 Lpd. In response to the acute need for a sufficient water supply and the existing and potential water resources in these communities, ARC planned to install wells in some study areas, to provide access to running water in other study areas, and to repair existing water systems in other areas.

The USAID guide sets an objective that 75% of the population have access to and use hygienic sanitation facilities. During the baseline survey, fewer than 75% of households in all communities used hygienic sanitation facilities. To improve access to sanitation facilities, ARC's planned interventions included complete coverage of each study area with household latrines, except in Nueva Segovia where ARC planned a latrine project in only one of the two sections of the community.

At the baseline survey, 35% or fewer of the primary child caregivers and food preparers in all study areas demonstrated adequate hand washing knowledge or appropriate hand washing behaviors. Interventions planned by the ARC to address inadequate hand washing behavior included community health education programs to increase knowledge about and practice of appropriate hand washing behavior, and increasing the availability of hand washing facilities.

Water quality analyses showed that, in every country, most household and community water sources were contaminated with total coliform bacteria. Results from all countries were difficult to compare, however, because obtaining comparable data from the five in-country laboratories used during this study was not possible and interpreting the reported laboratory results was often difficult.

Discussions with the ARC water and sanitation (wat-san) delegates and local water boards in each country at the time of the baseline survey indicated that programming interventions in water, sanitation, and hygiene behavior appeared to be on target to meet USAID guidelines in all communities except Waspam, Nicaragua, where logistical restraints may limit the ability to meet the sanitation guidelines. CDC recommended that current intervention plans be modified; if possible, to address the water and sanitation needs of this community.

Baseline survey information was not collected for one study area in Guatemala; collection was planned for the second year of data collection and submitted as an addendum to the report, "American Red Cross Post-Hurricane Mitch Reconstruction Water and Sanitation Baseline Survey in Honduras, Nicaragua, El Salvador, and Guatemala, February 2000" (CDC, 2000).

CDC made the following recommendations after the baseline survey to better focus the ARC water and sanitation interventions and to improve the evaluation process:

- Continue with scheduled water and sanitation interventions, giving latitude to the in-country delegates to individualize programming as needed.
- Plan interventions so that all households have access to private or shared spigots, except for Waspam, Nicaragua, where the number of wells constructed should be increased to eight community wells in each town. These interventions will allow each community to attain the goal of 250 people per water-collection point and bring all households within 200 meters (m) of a water source
- Install household water meters in a subset of homes that have water spigots before to the mid-term survey so the daily per capita water use of homes with household spigots can be estimated.
- Attempt to address the need for household latrines in Waspam, Nicaragua. The community council of Andres identified latrines as the community's greatest need.

- Focus health education programs on hand washing techniques, and place hand washing facilities near sanitation facilities to encourage hand washing behavior.
- Investigate adjusting the hand washing scores of respondents who do not have children, and who are thus less likely to perform behaviors associated with childcare.
- Because some of the in-country laboratories did not have the capacity to perform enumerative testing for *Escherichia coli* (*E. coli*), CDC was able to compare the household and community water samples qualitatively only for indicators of fecal contamination. CDC recommended that ARC standardize the analyses used by field personnel, train in-country personnel in the use of portable water testing kits, and analyze all water samples using the DelAgua test kit and use PurTest kit to confirm results.
- Retest community water sources in all study areas using a portable water testing kit, such as the DelAgua kit.
- Conduct a baseline survey in Study Area 2, Huitzitzil, Guatemala.
- Continue with plans for follow-up evaluations in all study areas in February 2001.

Status of the Interventions

The mid-term survey was performed approximately 1 year after the baseline survey, during the implementation phase of the water, sanitation, and education interventions in each study area. Table 1.1.2.1 summarizes of the status of the interventions in each country and study area at the time of the mid-term survey that was provided to CDC by the in-country ARC wat-san delegates on February 6, 2001, during the pre-survey training.

Purpose

The mid-term survey measured ARC's progress toward achieving the goals for access to water and sanitation facilities and hygiene conditions in the study communities from the baseline survey to the mid-term survey and to evaluate the health impact of ARC's interventions in these communities. The results will inform ARC about where to focus its efforts during the completion of the water and sanitation interventions in these communities and in the region. This report discusses the methods used to conduct the mid-term survey, the results of the survey for each study area, and the impact of the results of ARC's programming in the region.

Table 1.1.2.1 Status of Interventions, Mid-term Survey, February 2001

Country/ Study Area	**Intervention**		
	Water	**Sanitation**	**Education**
Honduras Las Lomas	• Water system designed but not constructed • Water and health committees established	• Household latrines constructed	• Education program on hygiene, water, and sanitation in place
Marcovia	• Water system completed • Water committee established	• Household latrines constructed	• Water-hygiene education complete • Sanitation-latrine education complete
Nicaragua Nueva Segovia	• Municipal water system installed (not ARC)	• Household latrines constructed	• Hygiene and sanitation education started Jan 2001
Waspam Kum and Andres	• Wells constructed (7) in Kum and wells planned (3) in Andres but not constructed	• Household latrines under construction in Kum and Andres	• Hygiene and sanitation education program completed and ongoing by ARC and other non-governmental organizations in Kum and Andres
El Salvador Las Pozas	• Water storage tanks installed by CARE, 80% completed • Water committee established	• Household latrines under construction, some damaged by the Jan and Feb 2001 earthquakes	• Hygiene and sanitation education 90% complete
La Ceiba	• Community tap completed, water tanks completed; some damage by Jan and Feb 2001 earthquakes • Water distribution system planned but not started • Water and health committees established	• Household latrines under construction, 80% complete	• Hygiene education program started in June 2000

Guatemala Chiquimula Plan y Travesia Guayabo	• Water system improved; water meters placed in some homes • Water committee established • Water system planned • Water committee established	• Household latrines under construction • Household latrines constructed	• Hygiene and latrine education complete in 1/3 of homes • Hygiene education completed as well at education on latrine construction and maintenance
Huitzitzil *	• No water intervention planned	• Household latrines under construction; 10 latrines completed at pilot homes excluded from survey	• 10 pilot homes received hygiene and sanitation education, excluded from survey

* Baseline survey completed for this study area in February 2001.

Methods

Study Team

The evaluation teams for each study area included one CDC investigator; the ARC country wat-san delegate; and/or the ARC country health delegate, representatives of the national Red Cross societies from each country, locally hired health promoters, and local Red Cross volunteers. In some countries, the ARC regional wat-san delegate, the ARC regional health delegate, and local ARC staff also participated. Before going to the field, the evaluation teams participated in a 2-day training program to gain interviewing skills, practice data entry into Epi Info 6 (CDC/WHO, 1996), and become familiar with the interview documents and procedures specific to the evaluation.

CDC investigators led the evaluation and collected and analyzed samples of water from community sources and households for microbial contamination using portable DelAgua Water Testing Kits (Oxfam, 2000) and PurTest kits. The ARC wat-san or health delegate arranged all logistics for the evaluation and assisted CDC investigators in training the evaluation teams and reviewing completed questionnaires and electronic data. Representatives of the national Red Cross societies from each country also assisted in training the evaluation teams and reviewing completed questionnaires. Locally hired health promoters and local Red Cross volunteers conducted the surveys in each community and input the data into databases in Epi Info.

Location of Studies

Two study areas were evaluated in each of the four countries. A study area is one community or several communities with similar demographics in the same geographic region that ARC selected to receive water and sanitation interventions. The study areas were selected to be representative of the other affected communities in the region and of the interventions provided by ARC to the other communities.

The mid-term survey was conducted in seven of the eight study areas in February 2001 (Table 2.2.1). The baseline survey was performed in Huitzitzil, Department of Esquintla, Guatemala, at this time because logistical constraints in February 2000 had limited the evaluation in Guatemala to one study area.

Table 2.2.1 Countries and Study Areas Evaluated During the Mid-term Survey, February 2001

Country	**Study Area 1**	**Study Area 2**
Honduras	Las Lomas	Marcovia
Nicaragua	Nueva Segovia	Waspam
El Salvador	Las Pozas	La Ceiba
Guatemala	Chiquimula	Huitzitzil*

*Baseline survey results will be provided as an addendum to the baseline survey report.

Study Design

In each study area, the evaluation consisted of

I. Household surveys,
II. Community surveys, and
III. Water sampling and analysis of community and household water sources.

Active surveillance for diarrhea was also performed in the two study areas in Nicaragua.

Household and Community Surveys

A cross-sectional household survey and a community survey to evaluate water and sanitation issues and resource availability were completed in each study area. The sample sizes required to detect an expected difference in each of the USAID indicators were calculated and compared to determine the sample size necessary for the cross-sectional household survey. The indicator of use of appropriate hand washing behaviors before and after interventions required the largest sample size; thus, the sample size for the household survey was based on this indicator. The sample size was calculated by assuming that proper hand washing behaviors would occur in 20% of households before the intervention (Billig, et al., 1999). After the intervention, the percentage of households practicing proper hand washing behaviors was predicted to increase to 40% (Billig, et al., 1999). A sample size of 91 households was calculated using Epi Info 6.01 (CDC, 1996), based on a power of 80% and a confidence interval (CI) of 95%. To account for refusals, a systematic sample (every Xth household, based on the size of the community) of 100 households was selected for each study area.

The household surveys combined interviews and observations conducted during a visual inspection of the water and sanitation facilities of each household. A trained interviewer conducted the household survey with the household member responsible for obtaining water for the household, the primary child caregiver, and the family member primarily responsible for food preparation. The parameters evaluated were water, sanitation, diarrhea prevalence, and breast-feeding practices, hand washing behavior, and health education focusing on water and sanitation issues.

The visual inspection included the household's water source, drinking water storage, and hand washing area and an assessment of the condition and level of use of the household sanitation facility. Specific criteria, defined in the USAID guide and interpreted by the CDC investigators, were used to assess the sanitation facilities to determine whether they were hygienic and in use.

Ideally, the community surveys were completed jointly during a meeting of the CDC investigator with people knowledgeable of the community projects such as community leaders, the in-country ARC wat-san or health delegate, and the local water committee for each community. However, if these key people were not available, the most qualified people were interviewed. Questions were included about water source, water system maintenance and cost, type and access to sanitation facilities, community composition, and access to health care.

Water meters were installed and water use data were collected in some household and community sources to verify the accuracy of the reported rates of water use.

Water Sampling and Analysis

Each community water source and stored water from a subset of households in all communities

in each study area were sampled for indicators of fecal contamination. A sample size of 10 households was calculated on the basis of a CI of 95%; a power of 80%; and the assumption that water, sanitation, and educational interventions would decrease the contamination of stored household water by 67% (Pinfold, 1990). To account for non-responses (e.g., people refusing to allow a water sample to be taken), the desired sample size was increased by 20% to 12. The CDC investigator or the ARC wat-san or health delegates collected water samples and analyzed them using a portable DelAgua Water Testing Kit (Oxfam, 2000) for total coliform bacteria and *E. coli*. Total coliform bacteria include, but are not limited to, both fecal coliforms and *E. coli*. The presence of total coliforms indicates that water may be contaminated with human or animal waste. The presence of *E. coli* is a positive indication of fecal contamination. For quality-control purposes, a sterile water blank was processed using the DelAgua kit and analyzed with each set of samples. Additionally, a randomly selected subset of all the water samples was tested with the PurTest test kit to analyze for the presence or absence of total coliform bacteria and *E. coli*. The results were qualitatively compared with the results obtained using the DelAgua kit.

The CDC investigator accompanied interviewers during data collection and collected water samples during household interviews. Both the community samples and the household water samples were collected in sterile containers and stored in coolers until they could be prepared for analysis (within 6 hours of collection) using the DelAgua kit. The PurTest sample was collected in a sterile container and allowed to incubate for 2 days.

Active Surveillance for Diarrhea

Active surveillance for diarrhea was conducted during the baseline and mid-term surveys in both study areas in Nicaragua. This data collection consisted of a questionnaire administered to each participating household that included a census of the household to gather information about the age and sex of all household members and to record the incidence of diarrhea in the previous week for each household member. Active surveillance of the incidence of diarrhea among members of these households continued with weekly follow-up visits for 4 weeks. A trained in-country interviewer with a health background conducted the follow-up visits with the ARC health delegate providing oversight during this data collection. Data on cases of diarrhea during the past year in the study population were collected from the local health clinics to compare with the active surveillance data.

USAID Guide

USAID's FANTA Project "Water and Sanitation Indicator Measurement Guide" (Billig, et al., 1999) formed the primary basis of the evaluation. This guide was developed to establish a reliable set of performance indicators for assessing and reporting to USAID in a consistent manner the effect of water and sanitation interventions in developing countries. The performance indicators include impact indicators and monitoring indicators. The impact indicators assess the effect of the interventions on the behaviors and health status of the beneficiaries and include measures of disease burden, hygiene behavior, and maintenance and use of water supply and sanitation facilities. The monitoring indicators are used to evaluate the progress of the interventions in achieving program goals.

For this project, the performance indicators (Billig, et al., 1999; Table 2.4.1) detailed in the USAID guide were used to evaluate whether the interventions provided to each community are effective in improving the health of the affected populations. The status of each of the communities with respect to the impact and monitoring indicators was evaluated during the baseline survey, and each community's progress toward achieving the goals established for each indicator was evaluated during the mid-term survey.

Table 2.4.1 Water and Sanitation Performance Indicators, Mid-term Survey, February 2001

Impact Indicators	Monitoring Indicators

• Percentage of children under <36 months with diarrhea in the last 2 weeks
• Quantity of water used per capita per day
• Percentage in household with appropriate hand washing behavior
  o Child caregivers
  o Food preparers
• Percentage of population using hygienic sanitation facilities
	• Percentage of households with year-round access to water
	• Percentage of households with access to a sanitation facility
	• Percentage of recurrent costs for water supply services provided by the community served
	• Percentage of constructed water supply systems operated and maintained by the communities served

Impact Indicators

1. Percentage of children under <36 months of age with diarrhea in the last 2 weeks. Diarrhea was defined as three or more loose stools in a 24-hour period.
2. Quantity of water used per capita per day. This quantity included all water collected by or delivered to the household and used for household chores but did not include water used to water the garden or domestic animals.
3. Percentage of child caregivers and food preparers with appropriate hand washing behavior. A score was given on the basis of the interviewees' ability to recite critical times at which they washed their hands (i.e., before eating, before cooking, before feeding children, after defecating, and after cleaning child's bottom) and to demonstrate good hand washing technique (i.e., use water, use soap, use both hands, rub hands 3 times, dry hands on towel or air dry).
4. Percentage of population using hygienic sanitation facilities. A sanitation facility was defined as a disposal facility for excreta (a latrine or toilet). A facility was considered hygienic if fewer than three flies were present and no excreta were found outside the latrine. A latrine was considered in use if one or more of the following conditions were met: the latrine had been recently cleaned with water, the latrine had a path leading to it, the latrine had been recently swept, the latrine was in repair, and had no spider webs.

Monitoring Indicators

1. Percentage of households with year-round access to water. A household was considered to have access if a direct connection existed to the home or a public facility within 200 m of the home and water was available from that source year-round. Improved water sources included any water source other than untreated surface water or unprotected well or spring (e.g., protected private or shared wells, protected private or shared springs).
2. Percentage of households with access to a sanitation facility. A household was considered to have access if the household had a private latrine or toilet or shared one with others in the community.
3. Percentage of recurrent costs for water supply services provided by the community served. Recurrent costs refer to the full operating and maintenance costs of the water supply that serves the community.
4. Percentage of constructed water supply systems operated and maintained by the communities served. Constructed facilities refer to those established by the project.

Results

Table 3.1 is a summary of the number surveys and samples collected during the baseline and mid-term survey.

Table 3.1 Completed Surveys and Water Samples Collected in Each Community
Baseline and Mid-term Survey, February 2001

Community	Number of Household Surveys	Number of Community Surveys	Number of Participants in Active Diarrhea Surveillance	Community Water Samples Collected	Household Water Samples Collected

Year	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
Honduras										
Las Lomas	106	**94**	1	**1**	N/A	**N/A**	1	**1**	13	**12**
Marcovia	92	**102**	1	**1**	N/A	**N/A**	1	**3**	13	**9**
Nicaragua										
Nueva Segovia	101	**105**	2*	**2***	101	**105**	9	**4**	23	**11**
Waspam	112	**103**	2*	**2***	112	**103**	7	**8**	14	**12**
El Salvador										
Las Pozas	98	**102**	1	**1**	N/A	**N/A**	4	**4**	13	**10**
La Ceiba	73	**62**	1	**1**	N/A	**N/A**	5	**5**	14	**10**
Guatemala										
Chiquimula	191	**97**	6	**2***	N/A	**N/A**	12	**6**	17	**9**
Huitzitzil+	N/A	**100**	N/A	**1**	N/A	**N/A**	N/A	**5**	N/A	**9**
Total Number of Samples in the Region	773	**765**	14	**11**	213	**208**	39	**36**	107	**82**

N/A not applicable.

***** Two communities make up one study area.

+ Baseline survey results to be provided as a separate addendum to the Baseline Report

Honduras

Study Area 1 - Las Lomas

The baseline survey was completed in Las Lomas on February 9-10, 2000. There were 130 households in the community with a population of 550 people. One hundred five surveys were completed in the community during the baseline survey.

At the time of the mid-term survey, there were 190 households in the community with a population of 1,190 people. A team of 10 interviewers, the ARC in-country water and sanitation delegate, and one CDC investigator conducted interviews from a subset of this community, 94 households, on February 14 and 15, 2001. The goal was to collect data from 100 households. Ninety-seven households were approached and 94 agreed to participate. The community was very motivated to participate in this study as demonstrated by the participation rate of 97% (94/97). Water samples from the community water source and from 12 randomly selected households where interviews were being conducted were collected and analyzed for indicators of fecal contamination. In addition, a community survey was completed with members of the water board who were knowledgeable of the water and sanitation conditions in Las Lomas. Forty-eight percent (45/94) of the households that participated in the mid-term survey had participated in the baseline survey of 2000.

Community Description

Las Lomas is an urban community in the Department of Catacamas in east-central Honduras. A community interview was conducted with the community water board and the ARC delegate to obtain background information about the community. At the time of both the baseline and mid-term survey, the community water board indicated that access to potable water was the community's single greatest need.

The people of this community are Latino and speak Spanish. A community council governs them. The two most common forms of employment are agriculture and housekeeping. The average education level of the population is third to fourth grade.

At the time of the baseline and mid-term surveys, the community had not received food aid related to the hardship caused by Hurricane Mitch. The Ministry of Health provides health care to all residents. The health care clinic is located in the Barrio El Hetillo in Catacamas, 6 km from the community of Las Lomas. All community members received training focusing on sanitation, hygiene, and water use in August and December 2000.

The community's water supply comes from a spring in the nearby mountains that are fed by gravity into a concrete holding tank, to a distribution system, and then to household spigots. This system has been operational since 1985. Currently, the system does not have the capacity to serve all 190 households in Las Lomas. Those households that receive water pay 10 lempiras ($0.64 US) per month for the service. The water is treated on a community level every five to six days by adding chlorine to the storage tank. The Ministry of Health tested the water in October 1999 and found it to be contaminated with microorganisms. The Ministry of Health subsequently treated the water in the storage tank in November 1999. The Ministry of Health tested the water in December 1999 and found no contamination. In February 2000, the ARC tested the water and found it to be contaminated with fecal coliforms and *E. coli*.

At the time of the baseline survey, few of the households in Las Lomas had dry pit latrines, but most of the households had no sanitation facilities. At the time of the mid-term survey, the ARC had nearly completed installation of pour-flush latrines for all households in Las Lomas.

Demographic Information

The mean household size during the mid-term survey was 5.5 people per household, which was the same as the household size in the baseline survey (5.6 people per household). On average, 0.6 children less than 36 months of age lived in each house, which is again similar to the number reported during the baseline survey (0.5 children).

During the mid-term survey, 79% (74/94) of the study participants reported living in their own home, 11% (10/94) lived with friends or family, and 11% (10/94) lived in a rented house. These percentages were generally the same as those reported in the baseline survey, 76% (80/105) living in their own home, 8% (8/105) living with friends or family, and 13% (14/105) living in a rented house.

Education

The mean education level reported in the mid-term survey was 2.2 years compared to 2.8 years reported in the baseline survey. The interviewees had one to six years of formal education. Forty-five percent (42/94) of interviewees had no formal education. Eighteen percent (17/94) of interviewees had completed six years of education. The education level of the respondents of the mid-term survey was similar to those surveyed during the baseline survey. During the baseline survey, 32 % (33/104) had no formal education and 22 % (23/104) had completed at least six years of education.

Status of Interventions

The interventions were community-specific and based on existing resources and needs. Table 3.1.1.1 summarizes the perceived community need before the intervention (i.e., February 2000) and the intervention planned by the ARC. Additionally, this table lists the status of each intervention at the time of the mid-term survey. Many of the planned interventions had been completed at the time of the mid-term survey.

Table 3.1.1.1 Community Needs, Planned Interventions and Status of Interventions
Honduras – Study Area 1 – Las Lomas, February 2001

Country/ Study Area	Perceived Community Need	Planned Intervention	Status of Intervention as of February 2001
Honduras - Las Lomas	Potable water	• Upgrade water system with new tanks and additional household connections ♦ Household latrines + Education program-hygiene, water use and sanitation	• Water system designed but not constructed, installed water meters on household and community sources, established water and health committees ♦ Constructed + Education program completed and on-going by ARC and Honduran Red Cross

Performance Indicators

Impact Indicators

Percentage of children under <36 months with diarrhea in the last two weeks

Table 3.1.1.2 summarizes the reported diarrhea prevalence and breast-feeding practice among children less than 36 months of age in the two weeks prior to the baseline and mid-term surveys.

Table 3.1.1.2 Diarrhea Prevalence and Breast-feeding Practice in Children
Honduras - Study Area 1- Las Lomas, February 2001

Age	Period Prevalence of Diarrhea* (per 100 children)		Percent of Children Breast-fed		Period Prevalence of Diarrhea Breast-feeding (per 100 children)		Period Prevalence of Diarrhea Not Breast-feeding (per 100 children)	
Year	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
≤ 6 months	0 (0/7)	**0 (0/6)**	100% (7/7)	**100% (6/6)**	0 (0/7)	**0 (0/6)**	0 (0/0)	**0 (0/0)**
7-12 months	46 (6/13)	**25 (3/12)**	46% (6/13)	**92% (11/12)**	57 (4/7)	**27 (3/11)**	33 (2/6)	**0 (0/1)**
13-24 months	22 (5/23)	**24 (4/17)**	26% (6/23)	**53% (9/17)**	50 (3/6)	**22 (2/9)**	12 (2/17)	**25 (2/8)**

25-35 months	33 (2/6)	**5 (1/20)**	17% (1/6)	**0% (0/20)**	0 (0/1)	**0 (0/0)**	40 (2/5)	**5 (1/20)**
< 36 months	27 (13/49)	**15 (8/55)**	43% (21/49)	**47% (26/55)**	33 (7/21)	**19 (5/16)**	22 (6/28)	**10 (3/29)**

* Illness occurred within the 2 weeks prior to the survey
< less than
≤ less than or equal to

The period prevalence of diarrhea decreased during the mid-term survey to 15 per 100 children, from 27 per 100 children during the baseline survey. The period prevalence decreased in all age groups except for those in the 13 to 24 month age group, which increased slightly.

About half of the women with children breast-fed their children during both surveys. However, the number of women breast-feeding increased in the 7 to 12 month and 13 to 24 month age ranges and decreased in the 25 to 35 month age range. There were 19 cases of diarrhea per 100 children who were breast-fed and 10 cases of children per 100 children with diarrhea who were not breast-fed. The prevalence of diarrhea in both the breast-fed and non breast-fed children decreased overall in both groups in the mid-term survey compared to the baseline survey. All age groups for both methods of feeding showed a decrease in period prevalence of diarrhea except for the children in the 13 to 24 month age in children who were not breast-fed, where there was an increase in the prevalence of diarrhea.

Quantity of water used per capita per day

The quantity of water used per capita per day is measured as the volume of water collected for each household divided by the number of people in the household. The type of water source and the amount of water used to perform household chores and to bathe impact the per capita daily water use. Water meters were installed prior to the mid-term survey on a subset of household taps and taps serving groups of homes to estimate the daily per capita water use of homes with household spigots.

Per Capita Daily Water Use

Water usage in the participating households was calculated based on self-reported use of water collected and stored in culturally specific water containers. The average volume of water collected per person per day in the mid-term survey was 54 liters (L) (range: 2 to 475 L/person/day). Forty-seven percent (44/94) of the households used more than the Sphere guideline of 15 L/person/day and 27% (25/94) used more than the USAID guideline of 50 L/person/day. These results are similar to those reported in the baseline survey, in which 50% (51/102) of the population used more water than the Sphere guideline of 15 L/person/day and 27% (28/102) used more water than the USAID guideline of 50 L/person/day.

Water Source and Volume Collected

The residents of Las Lomas used a variety of water sources. The types and distribution of water sources changed after Hurricane Mitch and at the time of the midterm survey, and are expected to change again once the water interventions have been finalized. Figure 3.1.1.1 summarizes the

water sources before Hurricane Mitch, at the time of the baseline survey, and at the time of the mid-term survey.

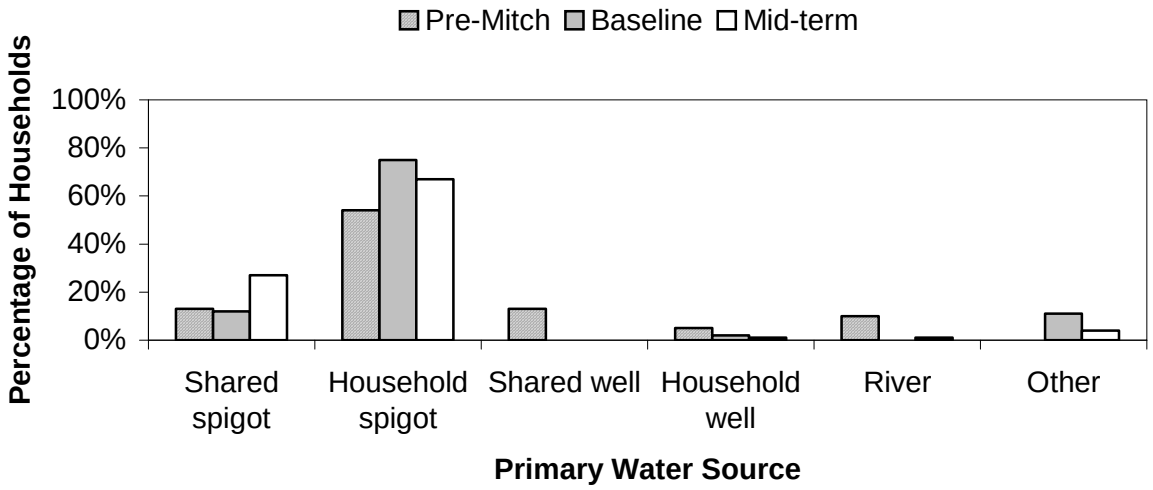

Figure 3.1.1.1 Water Source Before and After Hurricane Mitch and During the Mid-term Survey Honduras - Study Area 1 - Las Lomas, February 2001

Prior to the hurricane, the majority of water was obtained from household spigots, 54% (57/105). After Hurricane Mitch, at the time of the baseline survey, 75% (77/103) of the households obtained their water from a household spigot. During the mid-term survey, the water obtained from the household spigot decreased to 67% (63/94), however use of household spigots remained higher than all other sources combined. Shared spigots were also a source of water and their use increased from 13% (14/105) and 12% (12/103) prior to Hurricane Mitch and at the time of the baseline survey, respectively to 27% (25/94) during the mid-term survey. One percent (1/94) of the residents purchased their water during the mid-term survey, and 3% (3/94) obtained their water from a nearby family.

The volume of water collected during the baseline and mid-term surveys is shown in Table 3.1.1.3, stratified by water source. Household spigots provided the greatest volume of water per household during the mid-term survey, an average of 288 L/day. The least amount of water, 38 L/day, was collected from private household wells. During the baseline survey, participants also reported collecting the greatest volume of water from household spigots (253 L/day), and the least amount reported was purchased in a nearby city (62 L/day).

Table 3.1.1.3 Daily Volume of Water Collected in Each Household by Water Source Honduras - Study Area 1 - Las Lomas, February 2001

Water Source	Number of	Daily Volume (liters/day)

	Households		Range		Average		Median	
Year	2000 N=104	**2001** N=94	2000	**2001**	2000	**2001**	2000	**2001**
Shared spigot	13	**25**	19-836	**0-999**	213	**203**	76	**76**
Household spigot	77	**63**	0-895	**0-999**	253	**288**	209	**61**
Private well	2	**1**	38-114	**38**	76	**38**	76	**38**
Purchased	3	**0**	38-182	**--**	88	**--**	45	**--**
River	0	**1**	--	**92**	--	**92**	--	**92**
Other	9	**4**	38-91	**21-40**	62	**34**	57	**38**

Water Meter Data

Water meters were installed on household taps to provide an accurate measure of the amount of water used in each home or group of homes that used household spigots as their primary source of water. Water meters were installed at 10 private taps and one tap shared among three families and water usage data was collected over a one-month period from January 18 through February 11, 2001. The volume of water use displayed by the meter was recorded every 2 days within this time period, resulting in a total of 13 meter readings. Table 3.1.1.4 summarizes the results of the water meter data.

Table 3.1.1.4 Water Meter Data Summary
Honduras – Study Area 1- Las Lomas, February 2001

Type of Meter	Number of Meters	Number of Metered Households	Range of Daily Water Use (L/day)	Average Daily Volume (L/day)	Median Daily Water Use (L/day)
Household	11	13	2,429 - 7,863	5,258	5,407

The average daily water used per household was 5,258 L from the 13 meters with a median usage rate of 5,407 L/day. The average water usage rate reported by the study participants in the mid-term survey who used household spigots was 288 L/day, nearly 20 times lower than the meter readings, and the median usage rate of the 63 households surveyed was 61 L/day.

Access to Water

The temporal aspect of access to water was measured as the length of time each day people had to wait to get water and if a water source provided water year-round. Eighteen percent (17/94) of households in the mid-term survey reported that they had to wait to get water at least some of the time. Of those who had to wait, 29% (5/17) said that they had to wait longer than one hour, while 65% (11/17) said that they had to wait less than 30 minutes. When compared to the baseline survey, the percentage of people who reported waiting longer than one hour decreased from 59% (23/39) and the percentage of people who reported waiting less than 30 minutes increased from 36% (14/39).

Forty-seven percent (44/94) of households in the mid-term survey reported having water all day long, which is less than the baseline survey (76% (80/105)). The percentage of households reporting that their primary water source provided water all year was about the same in the mid-term survey, 72% (68/94), as the baseline survey, 68% (71/104).

Home Water Use

The home water use variables, summarized in Table 3.1.1.5, include the frequency and sites where participants washed clothes and bathed. In the mid-term survey, households reported washing clothes an average of 5 times a week (range: 1 to 7 times per week). Seventy-five percent (70/94) of households reported washing clothes at their home, 21% (20/94) of households reported washing their clothes at a neighbor's house, and 3% (3/94) reported washing their clothes in the river or creek. Ninety-eight percent (92/94) of households bathed in the same place they washed clothing. Eighty-seven percent (81/93) of interviewees reported that they bathed daily. The remaining 13% (12/93) of respondents bathed with a variety of frequencies. Home water use remained about the same in the mid-term survey as reported in the baseline survey.

Table 3.1.1.5 Summary of Household Water Use
Honduras – Study Area 1 – Las Lomas, February 2001

Home Water Use	Baseline Survey 2000	**Mid-term Survey 2001**
Wash clothes (average)	5 times/week	**5 times/week**
Wash clothes at home	72% (75/104)	**75% (70/94)**
Wash clothes at a neighbor's house	15% (16/104)	**21% (20/94)**
Wash clothes in a river/creek	9% (9/104)	**3% (3/94)**
Bathe where they wash clothes	89% (93/105)	**98% (92/94)**
Bathe daily	89% (92/105)	**87% (81/93)**
Bathe at other frequency	12% (13/105)	**13% (12/93)**

Percentage of child caregivers and food preparers with appropriate hand washing behavior

The assessment of appropriate hand washing knowledge and behavior was based on the interviewees' ability to recite critical times at which they wash their hands and to demonstrate good hand washing technique. Proper hand washing is one of the most effective ways to break the fecal-oral route of disease transmission. Hand washing knowledge was self-reported and behaviors were observed and scored by the interviewer. A passing score was eight or more correct responses out of ten (8/10) (Billig et al., 1999). Unanswered questions were considered a "no" response. The ARC interventions include a health education component that should increase the knowledge and practice of proper hand washing. Hands washing knowledge and behavior of the primary child caregiver and food preparer are shown in Tables 3.1.1.6 and 3.1.1.7.

Primary Child Caregiver

Comparison of the mid-term and baseline surveys shows that there was an increase in the number of primary child caregivers with passing scores of 8/10 or greater: 47% (30/64) in the mid-term survey versus 18% (19/105) in the baseline survey. Hand washing was most frequently reported before cooking for both surveys. Hand washing was least reported after cleaning a child's bottom during both surveys. During the mid-term survey, all of the primary caregivers used water to wash their hands and 80% (49/61) used soap. Results for hand washing knowledge improved from the baseline survey while hand washing behavior remained about the same from the baseline to the mid-term survey. However, more people dried their hands on a towel or air-dried them and used soap during the mid-term than the baseline survey.

Table 3.1.1.6 Primary Child Caregiver Hand Washing Knowledge and Behavior
Honduras - Study Area 1 - Las Lomas, February 2001

Primary Child Caregiver		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	52% (55/105)	**70% (42/61)**
	Before cooking	67% (70/105)	**82% (50/61)**
	Before feeding children	21% (22/105)	**44% (27/61)**
	After defecating	70% (73/105)	**75% (46/61)**
	After cleaning childrens' bottom	10% (10/105)	**20% (12/61)**
How do you wash your	Use water	99% (103/104)	**100% (61/61)**
	Use soap	74% (77/104)	**80% (49/61)**

hands? (behavior)	Use both hands	98% (102/104)	**97% (59/61)**
	Rub hands, 3 times	91% (95/104)	**93% (57/61)**
	Dry hands on towel or air dry	38% (39/104)	**67% (41/61)**
Total passing score (8 of 10)		18% (19/105)	**47% (30/64)**

≥ greater than or equal to

Household Food Preparer

Comparison of the mid-term and baseline surveys shows that there was an increase in the number of passing scores of 8/10 or greater from the baseline to the mid-term survey: 40% (38/94) in the mid-term survey versus 17% (18/105) in the baseline survey. Hand washing was most frequently reported before cooking in both surveys. Hand washing was least reported after cleaning a child's bottom in both surveys. During the mid-term survey, 100% (94/94) of the women used water to wash their hands and 79% (74/94) used soap. The mid-term results for hand washing knowledge improved from the baseline survey while hand washing behavior remained about the same in the baseline survey. However, more people dried their hands on a towel or air-dried them and used soap during the mid-term than the baseline survey.

Table 3.1.1.7 Household Food Preparer Hand Washing Knowledge and Behavior
Honduras - Study Area 1 - Las Lomas, February 2001

Household Food Preparer		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	53% (56/105)	**67% (63/94)**
	Before cooking	69% (72/105)	**85% (80/94)**
	Before feeding children	19% (20/105)	**39% (37/94)**
	After defecating	70% (73/105)	**79% (74/94)**
	After cleaning children's bottom	8% (8/105)	**13% (12/94)**
How do you wash your hands? (behavior)	Use water	100% (104/104)	**100% (94/94)**
	Use soap	74% (77/104)	**79% (74/94)**
	Use both hands	99% (103/104)	**96% (90/94)**
	Rub hands. 3 times	92% (96/104)	**92% (86/94)**
	Dry hands on towel or air dry	38% (40/104)	**66% (62/94)**
Total passing score (8 out of 10)		17% (18/105)	**40% (38/94)**

≥ greater than or equal to

People living in households where there are no children will be less likely to report hand washing activity before or after interaction with children. However, no differences in scoring were made to account for the fact that people who do not live with young children would be less likely to think of these answers than those living with young children. Therefore, the overall hand washing scores of primary child caregivers and food preparers in households with children less than three years of age and households with no children less than three were compared. Results between the two groups demonstrate that primary child caregivers and food preparers with children are more likely to have a passing hand washing score than those who do not have children. For the primary child caregiver, 51% (22/43) of those with children less than three years old had a passing hand washing score compared to only 16% (8/51) of households with no children less than three. Results for the food preparer were similar with 51% (22/43) of households who had children less than three years old receiving a passing score, compared to 31% (16/51) of food preparers with no children less than three years old receiving a passing score.

Hand Washing Education

The Red Cross conducted a majority of the health education workshops (charlas) focusing on hand washing behavior that were reported by the study participants in the mid-term survey. The mid-term survey showed that 44% (41/93) of households received a charla on proper hand washing behavior. This is an increase from the baseline survey, in which 11% (11/102) of the households received a charla (Figure 3.1.1.2), and the majority of charlas were given by the Centro de Salud (Salud Publica). Most charlas in the mid-term survey were given at the home or at a community center with the female head of household or with the entire community.

The results showed that 43% (13/30) of the primary child caregivers and 50% (19/38) of the food preparers who received a charla on hand washing had a passing hand washing score. For those who did not receive a charla, only 33% (16/4) of the primary child caregivers and 31% (18/49) of the food preparers had a passing hand washing score (Figure 3.1.1.2).

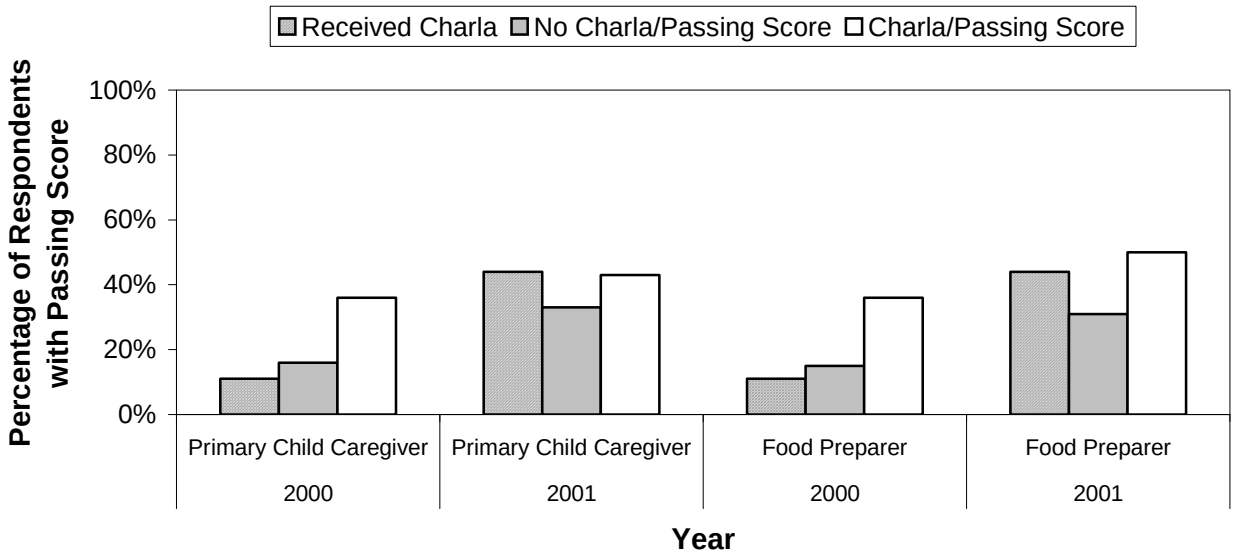

Figure 3.1.1.2 Comparison of Health Education and Hand Washing Scores
Honduras – Study Area 1 - Las Lomas, February 2001

Percentage of population using hygienic sanitation facilities

Proper disposal of excreta is essential to protect the health of the community members, particularly children. This indicator focuses on the percentage of the population that used hygienic sanitation facilities, where a sanitation facility is defined as a functioning toilet or latrine where excreta are disposed. This indicator was met if the facility was hygienic and used by household members greater than 12 months of age.

A facility was considered hygienic if there were less than three flies present and no excreta were found outside the latrine. It was considered in use if the latrine had one or more of the following conditions: it had been recently cleaned with water, there was a path to the latrine, there were signs of recently being swept, there were signs of recent repair, and there were no spider webs.

Use of Hygienic Facilities

Table 3.1.1.8 is a summary of the characteristics of the sanitation facilities. The number of people using a latrine increased during the mid-term survey compared to the baseline survey. Additionally, the number of hygienic latrines that were in use and the number of people who were using hygienic facilities increased. More of the study participants disposed of a baby's waste in a latrine during the mid-term survey than during the baseline survey and less people disposed of waste in places other than a latrine. A hand washing area, on average, was located closer to a latrine during the mid-term survey (10 m) than during the baseline survey (20 m).

Table 3.1.1.8 Sanitation Facility-Use and Practice
Honduras – Study Area 1 - Las Lomas, February 2001

Sanitation Facilities	Percent Baseline Survey 2000	*Percent* **Mid-term Survey 2001**

Total population >12 months of age using a latrine	53% (303/570)	**87% (436/501)**
Latrines that are hygienic and in use *	45% (31/69)	**90% (81/90)**
Population >12 months of age using a hygienic* latrine	24% (136/570)	**79% (394/501)**
Dispose of baby's** waste in a latrine	40% (10/25)	**55% (12/22)**
Dispose of baby's waste not in a latrine	56% (14/25)	**9% (2/22)**
Mean distance to hand washing area	20 m	**10 m**

* Hygienic if <3 flies present and no excreta are found outside the latrine. In use if latrine had one or more of the following: recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair, and no spider webs.
** baby defined as a child less than 12 months of age
> greater than

Education on Care and Use of Latrines

The Red Cross conducted a majority of the health education charlas focusing on the care and use of latrines that were reported by the study participants. The mid-term survey showed that 47% (44/93) of households reported receiving a charla on the care and use of latrines, an increase from the baseline survey, in which 12% (12/103) of the households received a charla (Figure 3.1.1.3), and the majority of these charlas were given by the Centro de Salud (Salud Publica). Most charlas in the mid-term survey were given in the home or at a community center with the female head of household or with the entire community.

The mid-term results showed that 86% (38/44) of the survey participants who had received a charla on the care and use of latrines of latrines had hygienic latrines. Eighty-eight percent (43/49) of those who did not receive a charla had hygienic latrines (Figure 3.1.1.3).

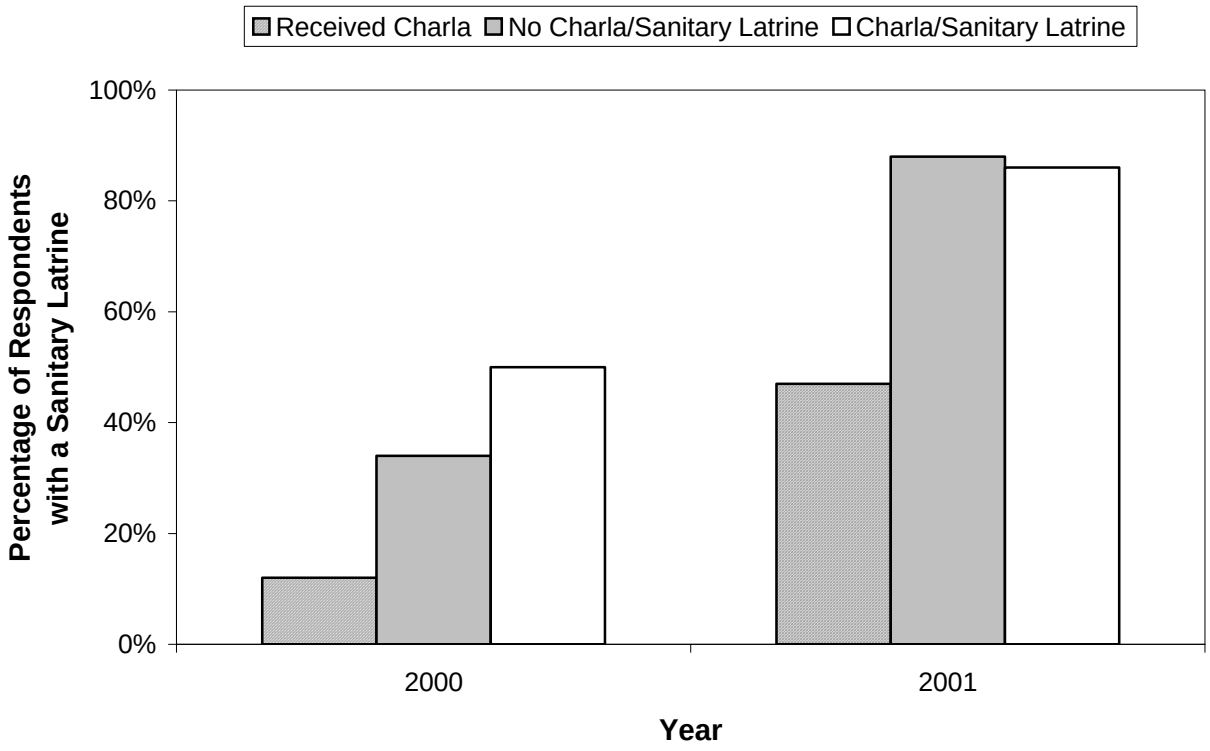

Figure 3.1.1.3 Comparison of Health Education and Sanitary Latrines
Honduras - Study Area 1, Las Lomas, February 2001

Monitoring Indicators

Percentage of households with year-round access to water

This indicator is a measure of the homes that have an adequate public, private, or shared water source that is located within 200 meters of the home and is used for drinking, cooking, cleaning, and bathing. No particular level of water quality is implied. Water sources defined as "adequate" may include protected wells and springs, but do not include untreated surface waters.

During the mid-term survey, 94% (59/63) of participating households reported year-round access to an improved water source that was located within 200 m of the house. This increased from the baseline survey, in which 89% (56/63) of households reported using an improved water source within 200 m of the house. The average distance to an improved water source in the baseline survey was 19 m, which is similar to the average distance of 21 m reported in the mid-term survey. In Las Lomas, adequate water sources included shared spigots, private household spigots, and private wells.

Prior to Hurricane Mitch, households reported traveling an average of 3 km (3000 m) to get water (median 8 m) with a range of 0 m to 80 km, as reported in the baseline survey. A reported distance of 0 m indicates that a water source is located at the home. After Hurricane Mitch, at the time of the baseline survey, the median distance traveled decreased to 7 m. During the mid-term survey, the distance households traveled to their water source ranged from 0 m to greater than 1 km, with a mean distance of 47 m. The median distance traveled to get water was 7 m.

Interviewer estimates of distance from the interviewed household to its water source during the mid-term survey were slightly greater than estimates of the interviewees (i.e., mean distance of 49 m). According to interviewer estimates, 89% (84/94) of the households had water sources within 200 m of the household. As shown in Table 3.1.1.9, at the time of the baseline survey, the volume of water collected appeared to decrease with increasing distance. During the mid-term survey, no clear association with the distance from the household to the water source could be observed. However, the average volume of water collected decreased at a distance greater than 200 m.

Table 3.1.1.9 Daily Volume of Water Collected in Relation to Distance from Household to Water Source
Honduras - Study Area 1 - Las Lomas, February 2001

Distance (meters)	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=105	**2001 N=94**	2000	**2001**	2000	**2001**	2000	**2001**
≤ 10	66	**54**	0-895	**0-999**	264	**226**	214	**61**
11-50	21	**22**	11-836	**0-999**	218	**371**	84	**69**
51-100	4	**4**	0-418	**0-999**	123	**325**	38	**150**
101-200	6	**4**	38-159	**15-277**	82	**114**	74	**82**
201-500	6	**4**	38-114	**34-57**	63	**44**	57	**42**
501-998	1	**--**	45	**--**	45	**--**		**--**
≥ 999	1	**1**	19	**76**	19	**76**	19	**76**

≤ less than or equal to
≥ greater than or equal to
N/A not applicable for this data set

Percentage of households with access to a sanitation facility

A household was considered to have access to a sanitation facility if that household had a private facility or shared a facility with others in the community. During the mid-term survey, the percentage of households that reported having access to a sanitation facility increased to 96% (90/94) from 64% (63/98) during the baseline survey (Table 3.1.1.10). During the mid-term survey, most facilities were privately owned and were primarily pour flush latrines. During the baseline survey the participants also had mostly private facilities, but the majority of the facilities were dry pit latrines (Table 3.1.1.10).

Table 3.1.1.10 Household Access and Description of Sanitation Facilities
Honduras – Study Area 1 – Las Lomas, February 2001

Sanitation Facility	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Access to a latrine	64% (63/98)	**96% (90/94)**
Number of latrines inspected	68	**90**
Private facility	97% (61/63)	**98% (88/90)**
Shared facility	3% (2/63)	**2% (2/90)**
Dry pit latrines	96% (66/69)	**22% (21/90)**
Compost latrines	1% (1/68)	**--**
Pour flush latrines	1% (1/68)	**73% (69/90)**

Percentage of recurrent costs for water supply services provided by the community served

This indicator cannot be assessed until the water supply interventions are completed.

Percentage of constructed water supply systems operated and maintained by the

communities served
This indicator cannot be assessed until the water supply systems are completed in all study areas.

Water Quality Testing

The results of the analyses of the community water source and household water samples are summarized in Table 3.1.1.11. All water samples were processed using the portable DelAgua Water Testing Kit and total coliforms and *E. coli* were quantified and reported as colony forming units per 100 ml of water (CFU/100 ml). A subset of samples was analyzed in duplicate using the DelAgua kit, and a subset of samples was analyzed by a qualitative test using the PurTest kit to confirm the presence or absence of total coliforms and *E. coli*. A sterile water blank was analyzed with each batch of samples to verify that sterile conditions were being maintained.

Table 3.1.1.11 Community and Household Water Sources Receiving Treatment and Coliform Results
Honduras - Study Area 1 - Las Lomas, February 2001

Water Tested	Sample Size (N)		Water Treated		Percent of Samples Positive for Total Coliforms		Percent of Samples Positive for *E. coli*	
Year	2000	**2001**	2000	**2001**	2000*	**2001**	2000	**2001**
Community source	1	**1**	0% (0/1)	**0% (0/1)**	100% (1/1)	**100% (1/1)**	100% (1/1)	**100% (1/1)**
Household samples	11	**12**	36% (4/11)	**25% (3/12)**	64% (7/11)	**92% (11/12)**	64% (7/11)	**92% (11/12)**

* Results reported in the baseline survey are fecal coliforms.

Community Water Source
The community water source is from a nearby mountain spring that is gravity fed to a concrete holding tank that flows to the community's distribution system. In the mid-term survey, coliform bacteria were found in the water holding tank. The results of the quantitative analysis using the DelAgua Water Testing kit for both total coliform bacteria and *E. coli* were too numerous to count (TNTC).

Water samples in the baseline survey were sent to the Ministry of Health laboratory where samples were analyzed for fecal coliform bacteria using membrane filtration, a standard quantitative method. Results for the holding tank were 140 CFU/100 ml of fecal coliform bacteria. A qualitative test, the Colilert kit, detected the presence of total coliform bacteria in the holding tank.

These results indicate that the community water source was contaminated with total coliform bacteria, fecal coliform bacteria, and *E. coli* during both the baseline and the mid-term surveys. The results of the water quality testing are not directly comparable because the methods used were specific for different organisms and because some of the methods were quantitative and others were qualitative.

Household Water Samples

During the mid-term survey, water samples were taken from water stored in 12 households for drinking. As shown in Table 3.1.1.11, 92% (11/12) of samples were contaminated with total coliforms and 92% (11/12) contained *E. coli*. In all household samples, both total coliforms and *E. coli* were TNTC.

Twenty-five percent (3/12) of households where water was sampled reported treating their water on the day of the interview. The stored household water in each of these three households was contaminated with total coliforms and *E. coli*. Of the water samples taken at the remaining nine households that did not treat their water on the day of the interview, 89% (8/9) contained total coliforms and *E. coli*.

The percentage of contaminated water samples during the mid-term survey was compared to the percentage testing positive during the baseline survey. Nearly all of the household water samples contained total coliforms and *E. coli* during the mid-term survey and contained fecal coliform bacteria during the baseline survey. The results from the two surveys could not be directly compared because the analyses used were specific for different organisms. However, both surveys detected coliforms that indicate that the water samples were contaminated with fecal material.

Quality Assurance

One water sample was analyzed in duplicate using the DelAgua kit, and identical results were obtained for the duplicate samples. No bacteria grew in the sterile water blanks analyzed, indicating that sterile conditions were adequately maintained during processing of the water samples.

The results of the qualitative analyses run using the PurTest kit confirmed the results of the analysis using the DelAgua kit. The water holding tank tested positive for total coliforms and *E. coli* using both the PurTest kit and the DelAgua test kit, and the two household water samples that were analyzed using the PurTest kit were found positive for total coliforms and *E. coli*, confirming the results using the DelAgua test kit.

Storage, Handling and Treatment

A summary of the way water was stored, handled and treated in the homes in Las Lomas is shown in Table 3.1.1.12. Water in the home was stored, handled and treated similarly in the mid-term and the baseline survey. Slightly more of the households in the mid-term survey covered their water and obtained their water by dipping a cup into the storage container when compared to the baseline survey results. Fewer people poured their water into a glass and less study participants treated their water during the mid-term survey. Fewer people always or sometimes treated their household water and a greater percentage never treated their water. Finally, the number of people who treated household water with chlorine increased in the mid-term survey when compared to the baseline survey.

Table 3.1.1.12 Summary of Water Storage, Handling and Treatment
Honduras – Study Area 1 – Las Lomas, February 2001

Technique	Baseline Survey 2000	*Mid-term Survey 2001*
Storage and Handling		
Store water at home	91% (96/105)	**97% (91/94)**
Stored drinking water	100% (105/105)	**96% (90/94)**
Covered drinking water	75% (76/102)	**84% (76/90)**
Dip in a cup for water	80% (84/105)	**86% (76/90)**
Pour water into a cup/glass	14% (15/105)	**9% (8/90)**
Treatment		
Treated water day of survey	40% (42/105)	**32% (30/93)**
Always treated their water	39% (31/103)	**29% (26/91)**
Sometimes treated their water	39% (40/103)	**30% (27/91)**
Never treated their water	31% (32/103)	**42% (38/91)**
Treat water with chlorine	59% (60/101)	**77% (44/57)**
Treat water by boiling	12% (12/101)	**11% (6/57)**

Water Treatment Education

The ARC conducted a majority of the health education workshops (charlas) focusing on proper storage and treatment of water reported by the study participants in the mid-term survey, whereas the Centro de Salud (Salud Publica) conducted a majority of the health education charlas during the baseline survey. The survey showed that 48% (45/94) of households reported receiving a charla on how to treat household water, compared to 11% (11/102) of the households during the baseline survey. Most of the charlas in the mid-term survey were given in the home or at the community center and were given to the female head of household or the entire community.

No apparent difference was seen in the prevalence of observed water-related activities between study participants who did and did not receive a charla on proper storage, handling and treatment of household water. Figure 3.1.1.4 summarizes the observed activities for those who did and did not receive charlas on the storage and handling of household water.

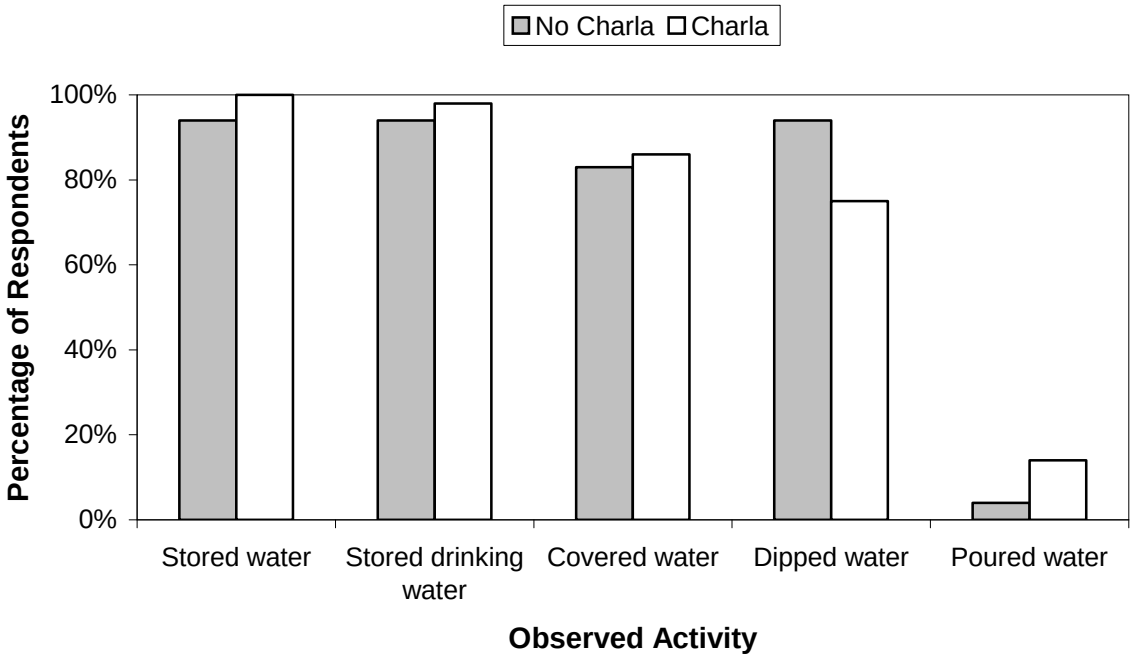

Figure 3.1.1.4 Water Storage Activities Observed by Interviewer in Relation to Receiving a Charla on Proper Storage and Handling of Water
Honduras – Study Area 1 – Las Lomas, February 2001

Figure 3.1.1.5 summarizes the reported activities for those who did and did not receive a charla on water treatment. Forty-nine percent of respondents who received a charla reported treating their water on the day of the survey, compared to only 17% of those who had not received a charla, and 70% of respondents receiving a charla treated their water either always or sometimes, compared to 49% of those not receiving a charla. Both respondents who did and did not receive a charla reported treating their water with chlorine, 78% and 76%, respectively. A small number of study participants boiled their water during the mid-term survey, regardless of whether they had received a charla on water treatment. The results show that those who received a charla were more likely to treat their water the day of the survey and treat household water either always or sometimes, most probably with chlorine.

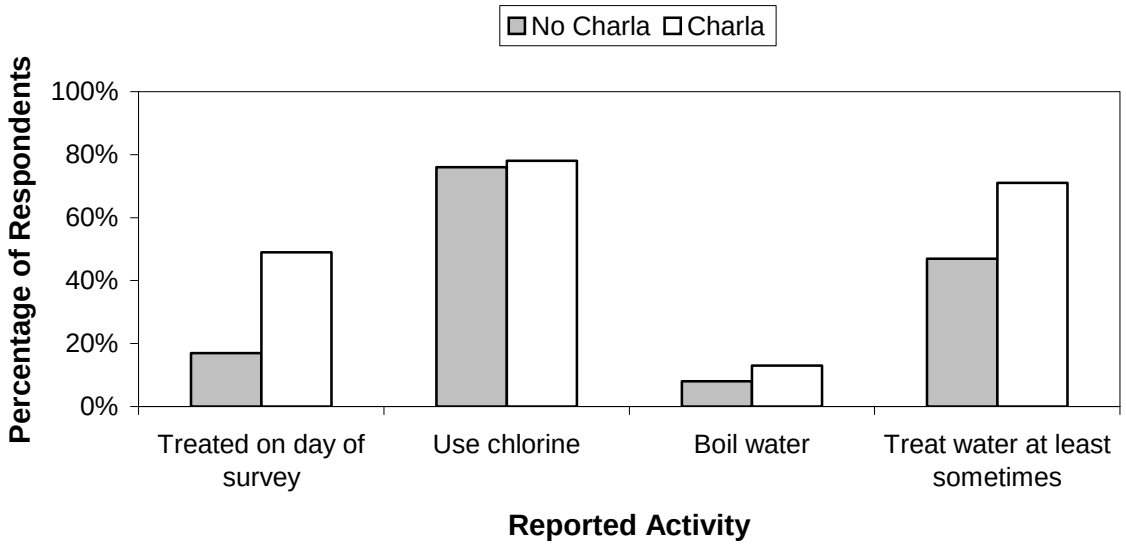

Figure 3.1.1.5 Water Treatment Activities Reported by Study Participants in Relation to Receiving a Charla on Proper Treatment of Water
Honduras – Study Area 1 – Las Lomas, February 2001

Water samples were taken from three households that reported receiving education on proper water treatment. Two of the three homes' stored water tested positive for total coliform bacteria and *E. coli*. Household water samples were also taken from two households that reported that they had received no education on proper water treatment techniques, but where the water was reported to be treated on the day of the survey. The water samples tested from both of these households tested positive for both total coliforms and *E.coli*.

Discussion

The baseline and mid-term survey USAID Impact Indicators in Las Lomas are summarized in Table 3.1.1.13. Comparison of these data shows that the interventions are improving the health of the community and their access to and use of water and sanitation facilities. It should be recognized that the interventions are in progress and the final survey in February 2002 will clearly define the impact of the interventions on this community. Nevertheless, at the time of the mid-term survey, goals were already met for four of the seven indicators.

Table 3.1.1.13 Performance Indicators
Honduras - Study Area 1 - Las Lomas, February 2001

Performance Indicator	USAID Guideline	Status During Baseline Survey (2000)	Final Goal (2002)	Status During Mid-term Survey (2001)	Percent Difference : Baseline to Mid-term[1]	Progress To Goal: Baseline to Mid-term[2]	Status Relative to Final Goal[3]
Impact Indicator							

Children under <36 months with diarrhea in the last 2 weeks[4]	25% decrease	27 (13/49)	≤20	15 (8/55)	44% decrease	NA	>100%
Quantity of water used per capita per day	100% using 50 Lpd	27% (28/102)	100%	27% (25/94)	NA	0% increase	27%
Child caregiver with appropriate hand washing behavior	50% increase	18% (19/105)	≥27%	47% (30/64)	161% increase	NA	>100%
Food preparers with appropriate hand washing behavior	50% increase	17% (18/105)	≥26%	40% (38/94)	135% increase	NA	>100%
Population using hygienic sanitation facilities[5]	75% usage	24% (136/570)	≥75%	79% (394/501)	NA	51% increase	>100%
Monitoring Indicator							
Households with year-round access to water[6]	NE	89% (56/63)	100%[7]	94% (59/63)	NA	6% increase	94%
Households with access to a sanitation facility	NE	64% (63/98)	100%[7]	97% (90/93)	NA	52% increase	97%

1 Calculated ONLY for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values
2 Calculated ONLY for indicators with goals with an absolute goal (e.g., 100%) by subtracting the baseline value from the mid-term value
3 Status with respect to the final goal for each indicator, calculated for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values divided by the goal, calculated for those with an absolute goal (e.g., 100%) by dividing the mid-term value by the goal; >100% indicates that the goal was exceeded
4 Goal is a reduction in the number of cases of diarrhea per 100 children in the study population.
5 A facility is considered hygienic if there are less than 3 flies present and no excreta are found outside the latrine. A latrine is IN USE if latrine it has one or more of the following conditions: recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
6 Water source is less than 200 meters away from the household and there is access to water year-round.
7 Goal was established by the American Red Cross
NE none established

Impact Indicators

The overall period prevalence of diarrhea in all children less than 36 months decreased from 27 to 15 cases of diarrhea per 100 children and met the proposed final goal for this indicator of a 25% decrease in period prevalence of diarrhea at the time of the mid-term survey. The number of children who breastfed increased, and both children who breast fed and those who did not showed a decrease in the period prevalence of diarrhea during the mid-term survey compared to the baseline survey. Increased access to and use of sanitation facilities and in hand washing

knowledge and behaviors of primary child caregivers and food preparers likely contributed to the decrease in prevalence of diarrhea in children less than 36 months of age.

The USAID guideline recommends that 100% of households obtain 50 L/person/day of water for household use. The percentage of households that obtained 50 L/person/day or greater was 27% in both the baseline and the midterm surveys. The primary source of water in both surveys was household spigots, which provided the greatest volume of water of all water sources used in Las Lomas. This indicates that either the households were under-reporting their water usage or that they were using less than 50 L water/person/day.

The average daily water metered volume in households with private or shared spigots was 5,258 L per household, compared to the average self-reported volume of 288 L/day per household, indicating that households may indeed have under-reported their daily use. However, some of the meters and distribution system pipes were known to leak and some households watered cattle from their household spigots. Thus, it is difficult to fully assess the discrepancy between the metered and reported volumes without further evaluating the community water use patterns and the water distribution system. Nevertheless, the planned water tank had not been built at the time of the mid-term survey. Completion of the tank is likely to increase the availability of larger quantities of water to the households of this community, which should allow the community to achieve greater per capita daily water use by the time of the final survey in February 2002.

Waiting time for water decreased from the time of the baseline to the midterm survey. The majority of people had to wait less than 30 minutes for water in the mid-term survey, whereas most people had to wait for water for over an hour during the baseline survey. This improvement is due to the improvements made in the distribution system, including increasing the number of household connections.

Appropriate hand washing behavior is critical in breaking the fecal-oral route of disease transmission. The results for this indicator showed that more child caregivers and food preparers received charlas and more received passing hand washing scores during the mid-term survey than the baseline survey. The knowledge of when to wash their hands increased in all categories for the primary child caregiver and the food preparer, and knowledge of proper hand washing technique increased slightly between surveys. The primary child caregiver and food preparer may be the same person in some cases that may be a reason for similar results. The impact indicator goal of a 50% increase in the number of child caregivers and food preparers who passed the hand washing test between the baseline and the final survey was exceeded during the mid-term survey, indicating the success of the educational programming focusing on proper hand washing behavior.

The goal that 75% of the population use hygienic sanitation facilities was met during the mid-term survey. Comparison of the baseline and mid-term surveys showed that there were more hygienic latrines available to the population and 30% more of the population were using them during the mid-term survey than the baseline survey. A greater percent of the population also reported receiving charlas about proper care and maintenance of latrines during the midterm survey compared to the baseline survey. These improvements correspond with the completion of

two of the interventions: household latrines were constructed at the time of the mid-term survey and the education program for sanitation had also been completed.

Monitoring Indicators

An improved water source is one that can provide a sufficient amount of water to meet the needs of each person in a community, is located within 200 m of the household, and comes from a protected well or spring, or a treated surface water. In Las Lomas, the majority of households received water from a protected spring delivered through a distribution system, and private or shared spigots. The median distance traveled to get water, approximately 7 m, did not change between the baseline and mid-term surveys. The water distribution system in Las Lomas had been improved at the time of the mid-term survey, and was able to provide water year-round to 94% of the population. The baseline survey reported 89% year-round availability of water to the population. Although the ARC goal of 100% access to an improved water source was not reached by the time of the midterm survey, progress was made toward this goal, and a very high level of access was achieved. The new water tank was designed but not constructed at the time of the mid-term survey.

The ARC final goal of 100% access to a sanitation facility was nearly met at the time of the mid-term survey. Adequate access requires that no more than five families share a latrine (Billig, et. al., 1999), and access to a latrine is counted regardless of whether the latrine is used by the beneficiaries. Sixty-four percent of households had access to a latrine during the baseline survey, and access increased to 97% during the mid-term survey. Good progress has been made towards the goal of 100% access and is attributable to the completion of the household latrines at the time of the mid-term survey.

Water Quality Analysis

Quantitative analyses of the community water source and a subset of stored household water sources for total coliforms and *E. coli* showed that both community and household water sources were contaminated with total coliforms and *E. coli* at the time of the mid-term survey. The results from the baseline survey were compared to the mid-term survey in a qualitative manner because the results obtained during the baseline survey from an off-site laboratory were provided for fecal coliforms. The results from the baseline survey showed the presence of fecal coliform bacteria in the community water sample and most household water samples. The mid-term survey demonstrated the presence of *E.coli* in both household and community water samples. Household water samples of study participants that received water treatment education tested positive for *E. coli*, indicating that the charlas on water storage and treatment may not have been effective in teaching these techniques to the population of Las Lomas. However, the community water source also tested positive for *E. coli*, indicating that treatment of this source will be necessary to ensure that clean water is reaching the households, and to increase the likelihood that the people of Las Lomas use clean water for household uses.

Recommendations

The results of the mid-term survey showed that as the ARC water and sanitation interventions are being implemented, the proposed goals for the Impact Indicators were already met except for the per capita daily water use. The Monitoring Indicators had a goal of 100% for households having access to an improved water source and 100% access of households to a sanitation facility. The Monitoring Indicators did improve from the baseline to the mid-term survey and are likely to be attained by the time the final survey is completed in 2002. The ARC interventions completed so far have been effective in improving community health following a natural disaster, as demonstrated by the decrease in the prevalence of diarrhea in children less than 36 months of age. The CDC recommends that the ARC continue to focus on completion of the following tasks so that all proposed goals are met by the time the final survey is performed.

Water

At the time of the mid-term survey, upgrades to the water system were planned which included additional household connections. Since the water tank was designed but not constructed, completion of the water system is needed to provide continued improvements in year-round access to an improved water source.

Sanitation

Household latrines were constructed and nearly 100% coverage was demonstrated at the time of the mid-term survey. The availability of latrines should be verified to ensure that latrines are available to those who do not currently have access.

Water Quality Testing

The results from water quality testing demonstrated that household and community water supplies were contaminated with *E. coli*, and suggest the following recommendations:

- The community water supply should be monitored and treated with chlorine to ensure that clean water is distributed to the residents of Las Lomas.
- Results showed that even when education was provided, household samples tested positive for *E. coli*. Education on water treatment and care should continue throughout the community to ensure that household water is handled appropriately.

Study Area 2 – Marcovia

The baseline survey was completed in Marcovia on February 7th and 8th, 2000. There were 240 households in this community with a population of 1,440 people. Of these households, 92 surveys were completed.

At the time of the mid-term survey, there were 240 households in the community with a population of 1,200 people. A team of 10 interviewers, the ARC in-country water and sanitation delegate, and one CDC investigator conducted the interviews from a subset of this community, 102 households, on February 16th and 17th, 2001. The goal was to collect data from 100 households. One hundred four households were approached and 102 agreed to participate. The community was very motivated to participate in this study as demonstrated by the participation rate of 98% (102/104). Water samples from the three community water sources and from eight randomly selected households where interviews were being conducted were collected and analyzed for indicators of fecal contamination. In addition, a community survey was conducted with members of the water board who were knowledgeable of the water and sanitation conditions in Marcovia. Fifty-nine percent (58/98) of the households in the mid-term survey had participated in the baseline survey of 2000.

Community Description

Marcovia is an urban resettlement community made up of people affected by Hurricane Mitch in 1998. It is located in the Department of Choluteca in southern Honduras. A community interview was conducted with the treasurer and four other members of the water committee, the ARC health delegate, wat-san and health promoters to obtain background information about the community. At the time of the baseline survey, the water committee indicated that water and sanitation was the community's single greatest need. The community's greatest need at the time of the mid-term survey was to have opportunities for employment.

The people of this community are Latino and speak Spanish. A community council governs the people. The most common form of employment is agriculture, however, most women do not work outside of the home. The education level of the population is generally sixth grade.

At the time of the baseline and mid-term survey, the community had received no food aid related to the hardship caused by Hurricane Mitch and the community did not have a health care clinic. However, the people have access to health care at the clinic operated by the Ministry of Health in the old town of Marcovia, and a clinic run by CARE in the neighboring colonia.

The water supply is a community well built by the ARC. This system has been operational since June 1999. A distribution system was connected to the well on January 27, 2001. The water was tested by the Centro de Estudios y Control de Contaminantes (CESSCO) in June 1999 and was determined to be free from chemical and microbial contamination. The ARC tested the well in February 2000 and also found it to be free of microbial contamination.

During the baseline survey a few of the households that had not yet moved into the resettlement community had dry pit latrines, but none of the households in resettled Marcovia had sanitation

facilities. Since that time the ARC has completed pour flush latrines for each household in the community.

Demographic Information

The mean household size during the mid-term survey was 4.8 people per household, which was slightly lower than the household size in the baseline survey (5.0 people per household). On average, 0.4 children less than 36 months of age lived in each house, which is similar to the number reported during the baseline survey (0.5 children).

During the mid-term survey, 77% (78/102) of the study participants reported living in their own home, 16% (16/102) lived with friends or family, and 7% (7/102) lived in a rented house. The percentages were about the same as those reported in the baseline survey, 80% (73/91) living in their own home, 12% (11/91) living with friends or family, and 8% (7/91) living in a rented house.

Education

The mean educational level reported in the mid-term survey was 3.5 years, which is about the same as the baseline survey of 3.8 years. The interviewees' had zero to eleven years of formal education. Thirty-four percent (35/102) of interviewees had no formal education. Twenty-nine percent (30/102) had completed at least 6 years of education. The education level of the respondents of the mid-term survey was lower than that of those surveyed during the baseline survey. During the baseline survey, 24% (22/92) had no formal education and 46% (43/92) had completed at least six years of education.

Status of Interventions

The interventions were community-specific and based on existing resources and needs. Table 3.1.2.1 summarizes the perceived community need before the intervention (i.e., February 2000) and the ARC planned intervention. Additionally, this table lists the status of each intervention at the time of the mid-term survey. In June and November 1999, ARC presented health education programs to the community focusing on sanitation and use of water.

Table 3.1.2.1 Community Needs, Planned Interventions and Status of Interventions
Honduras – Study Area 2 – Marcovia, February 2001

Country/ Study Area	Perceived Community Need	Planned Intervention	Status of Intervention as of February 2001
Honduras – Marcovia	Water and sanitation	• Water distribution system and household spigots ♦Household latrines + Education program-hygiene, care and use of latrines	• System completed; water meters installed; and water committee established ♦ Constructed + Hygiene and latrine education completed by ARC and Honduran and Swiss Red Cross

Performance Indicators

Impact Indicators

Percentage of children under <36 months with diarrhea in the last two weeks

Table 3.1.2.2 summarizes the reported diarrhea prevalence and breast-feeding practice among children less than 36 months of age in the two weeks prior to the baseline and mid-term surveys.

Table 3.1.2.2 Diarrhea Prevalence and Breast-feeding Practice in Children
Honduras - Study Area 2 - Marcovia, February 2001

Age	Period Prevalence of Diarrhea* (per 100 children)		Percent of Children Breast-fed		Period Prevalence of Diarrhea Breast-feeding (per 100 children)		Period Prevalence of Diarrhea Not Breast-feeding (per 100 children)	
Year	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**

6 months	9 (1/11)	**50 (5/10)**	100% (11/11)	**80% (8/10)**	9 (1/11)	**50 (4/8)**	0 (0/0)	**50 (1/2)**
7-12 months	33 (2/6)	**30 (3/10)**	50% (636)	**70% (7/10)**	33 (1/3)	**29 (2/7)**	33 (1/3)	**33 (1/3)**
13-24 months	42 (8/19)	**19 (3/16)**	11% (2/19)	**38% (6/16)**	50 (1/2)	**50 (3/6)**	41 (7/17)	**0 (0/10)**
25-35 months	11 (1/9)	**22 (2/9)**	11% (1/9)	**22% (2/9)**	0 (0/1)	**50 (1/2)**	25 (2/8)	**14 (1/7)**
< 36 months	29 (13/45)	**29 (13/45)**	38% (17/45)	**51% (23/45)**	33 (7/21)	**43 (10/23)**	22 (6/28)	**14 (3/22)**

* Illness occurred within 2 weeks prior to the survey
< less than
≤ less than or equal to

The period prevalence of diarrhea in children less than 36 months of age was 29 cases per 100 children during the mid-term survey. About half of the women with children who were interviewed breast fed their children, 51% (23/45). There were 43 cases of diarrhea in children who were breast-fed and 14 cases of diarrhea in children who were not breast-fed.

The period prevalence of diarrhea remained constant during the baseline and midterm surveys (29 cases per 100 children). More women were breast-feeding children, however the prevalence of diarrhea in children who were breast-fed increased in the mid-term survey and was higher than for those children that were not breast-feeding.

Quantity of water used per capita per day

The quantity of water used per capita per day is measured as the volume of water collected for each household divided by the number of people in the household. The type of water source and the amount of water used to perform household chores and to bathe impact the per capita daily water use. Water meters were installed prior to the mid-term survey on a subset of household taps to estimate the daily per capita water use of homes with household spigots. A central water meter is also installed on the community water system.

Per Capita Daily Water Use

Water usage in the participating households was calculated based on self-reported use of water collected and stored in culturally specific water containers. The average volume of water collected per person per day in the mid-term survey was 79 L (range: 2 to 1,047 L/person/day). Eighty-two percent (83/101) of the households used more than the Sphere guideline of 15 L/person/day and 50% (51/101) used more than the USAID guideline of 50 L/person/day. More of the population used the recommended amount of water per day during the midterm survey than during the baseline survey, in which 64% (58/902) of the population used more water than the Sphere guideline of 15 L/person/day and 29% (26/90) used more water than the USAID guideline of 50 L/person/day.

Water Source and Volume Collected

The residents of Marcovia used a variety of water sources. The types and distribution of water sources in Marcovia changed after Hurricane Mitch and changed again once the water distribution system was completed. Figure 3.1.2.1 summarizes the water sources before Hurricane Mitch, at the time of the baseline survey, and at the time of the mid-term survey.

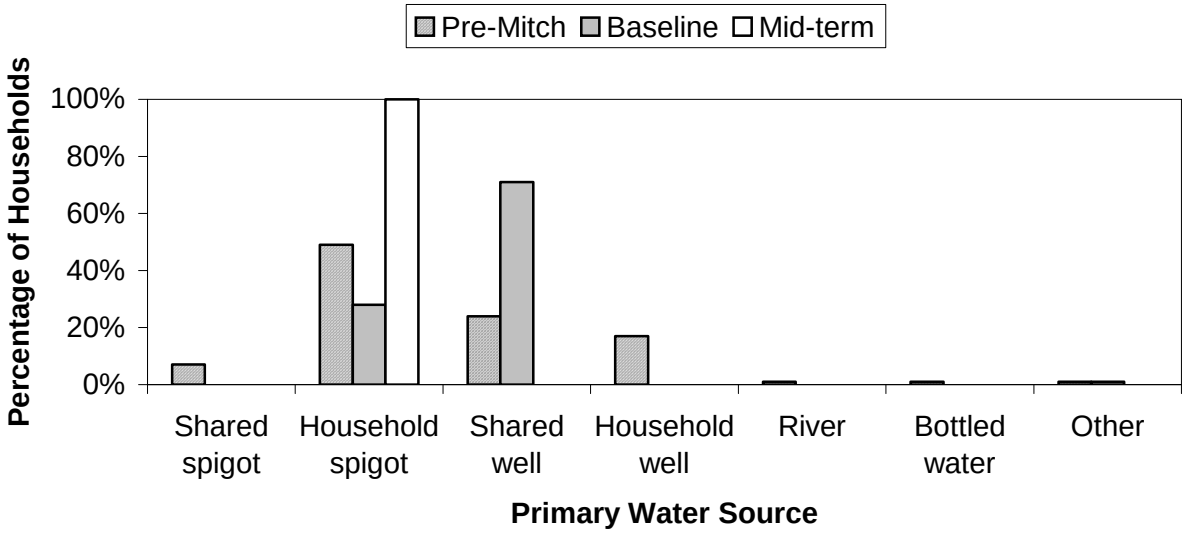

Figure 3.1.2.1 Water Source Before and After Hurricane Mitch and During the Mid-term Survey
Honduras – Study Area 2 – Marcovia, February 2001

Prior to the hurricane, the majority of water was obtained from household spigots, 49% (45/92). After Hurricane Mitch, at the time of the baseline survey, 71% (65/92) of the households obtained their water from a shared well. During the mid-term survey, all participants reported obtaining their water from a household spigot.

The volume of water collected by water source is shown in Table 3.1.2.3. During the mid-term survey, household spigots provided an average of 327 L/day. During the baseline survey, participants reported collecting the greatest volume of water from household spigots (465 L/day), and the least amount from a shared well (144 L/day).

Table 3.1.2.3 Daily Volume of Water Collected in Each Household by Water Source
Honduras - Study Area 2 - Marcovia, February 2001

Water Source	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
Year	2000 N=92	**2001 N=102**	2000	**2001**	2000	**2001**	2000	**2001**
Household spigot	26	**102**	60-912	**0-999**	465	**327**	433	**245**
Shared well	65	--	0-494	--	144	--	114	--
Purchased from truck	1	--	209	--	209	--	209	--

Water Meter Data

Water meters were installed at 12 household taps, the community water tank and the community well to provide an accurate measure of the amount of water used in each home and by the entire community. Data were collected once each day over a 17-day period from January 27 through February 12, 2001, resulting in a total of 17 meter readings. The range, average, and median volumes of water are summarized in Table 3.1.2.4. When a negative measure of water was estimated from the data, the value was not included in the calculation of the summary data.

Table 3.1.2.4 Water Meter Data Summary
Honduras - Study Area 2 – Marcovia, February 2001

Type of Meter	Number of Meters	Number of Metered Households	Range of Daily Water Use (L/day)	Average Daily Volume (L/day)	Median Daily Water Use (L/day)
Household	12	12	0 - 31,273	6,776	5,928
Water Tank	1	240	1,719 – 4,338	3,314	3,293
Community Well	1	240	2,255 – 6,658	3,953	3,865

The average daily water used per household was 6,776 L from the 12 metered homes. The average water usage rate reported by the study participants in the mid-term survey was 245 L/day; nearly 30 times lower than the meter readings. The average volume provided by the community well to the water tank is greater than the average volume of water provided by the water tank to the community.

Access to Water

The temporal aspect of access to water was measured as the length of time each day people had to wait to get water and if a water source provided water all year-round. Five percent (5/102) of households in the mid-term survey reported that they had to wait to get water at least some of the time. Of those who had to wait, 60% (3/5) said that they had to wait longer than one hour, while 20% (1/5) said they had to wait less than 15 minutes or from one-half to one hour. Most of the study participants, 95% (97/102), never had to wait. Most of the respondents of the baseline survey reported having to wait for water (88% (81/92)). During the baseline survey, 34% (27/80) had to wait longer than one hour, 33% (26/80) had to wait from one-half hour to 1 hour, 19% (15/80) had to wait from 15 minutes to one-half hour, and 15% (12/80) had to wait less than 15 minutes.

Eighteen percent (18/102) of households in the mid-term survey reported having water all day long, which is less than the baseline survey (78% (71/91)). Fewer households reporting that their primary water source provided water all year during the mid-term survey, 74% (75/102), than during the baseline survey, 85% (77/91).

Home Water Use

The home water use variables, summarized in Table 3.1.2.5, include the frequency and sites where participants washed clothes and bathed. In the mid-term survey, households reported washing clothes an average of 6 times per week (range: 2 to 8 times per week). Ninety percent (92/102) of households reported washing their clothes in the home, 4% (4/102) of households reported washing their clothes at a neighbor's house, and 5% (5/102) in the river or creek. Ninety-seven percent (99/102) of households bathed in the same place they washed clothing. Ninety-five percent (97/102) of interviewees reported that they bathed daily. The remaining 5% (5/102) of respondents bathed from 2 to 6 times per week. Home water use patterns changed during the mid-term survey compared to those reported during the baseline survey. During the midterm survey, respondents washed their clothes more frequently and the percentage of respondents who reported washing their clothes at home nearly doubled. A higher percentage of people bathed in the same place that they washed their clothes during the mid-term survey.

Table 3.1.2.5 Summary of Home Water Use
Honduras - Study Area 2 - Marcovia, February 2001

Home Water Use	Baseline Survey 2000	*Mid-term Survey 2001*
Wash clothes	4.4 times/week	**6.0 times/week**
Wash clothes at home	51% (47/92)	**90% (92/102)**
Wash clothes at a neighbor's house	15% (14/92)	**4% (4/102)**
Wash clothes in a river/creek	28% (26/92)	**5% (5/102)**
Bathe where they wash clothes	86% (79/92)	**97% (99/102)**
Bathe daily	92% (84/91)	**95% (97/102)**
Bathe at other frequency	8% (7/91)	**5% (5/102)**

Percentage of child caregivers and food preparers with appropriate hand washing behavior

The assessment of appropriate hand washing knowledge and behavior was based on the interviewees' ability to recite critical times at which they wash their hands and to demonstrate good hand washing technique. Proper hand washing is one of the most effective ways to break the fecal-oral route of disease transmission. Hand washing knowledge was self-reported and behaviors were observed and scored by the interviewer. A passing score was eight or more correct responses out of ten (8/10) (Billig et al., 1999). Unanswered questions were considered a "no" response. The ARC interventions include a health education component that should increase the knowledge and practice of proper hand washing. Hand washing knowledge and behavior of the primary child caregiver and food preparer are shown in Tables 3.1.2.6 and 3.1.2.7.

Primary Child Caregiver

Comparison of the mid-term and baseline surveys shows that there was an increase in the number of passing scores of 8/10 or greater from the baseline to the midterm survey: 50% (20/40) in the mid-term survey versus 18% 19% (17/92) in the baseline survey. Hand washing was most frequently reported after defecating during the mid-term survey, and before cooking during the baseline survey. Hand washing was least reported after cleaning a child's bottom during both surveys. During the mid-term survey, 100% (39/39) of the women used water to wash their hands and 87% (34/39) used soap. Results for both hand washing knowledge and behavior improved when compared to the baseline survey.

Table 3.1.2.6 Primary Child Caregiver Hand Washing Knowledge and Behavior
Honduras - Study Area 2 - Marcovia, February 2001

Primary Child Caregiver		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	62% (57/92)	**80% (32/40)**
	Before cooking	78% (72/92)	**78% (31/40)**
	Before feeding children	32% (29/92)	**53% (21/40)**
	After defecating	58% (53/92)	**83% (33/40)**
	After cleaning child's bottom	12% (11/92)	**23% (9/40)**
How do you wash your hands?	Use water	99% (91/92)	**100% (39/39)**
	Use soap	73% (67/92)	**87% (34/39)**
	Use both hands	96% (88/92)	**100% (39/39)**

(behavior)	Rub hands. 3 times	84% (76/91)	**92% (36/39)**
	Dry hands on towel or air dry	35% (32/92)	**56% (22/39)**
Total passing score (8 of 10)		19% (17/92)	**50% (20/40)**

≥ greater than or equal to

Household Food Preparer

Comparison of the mid-term and baseline surveys shows that there was an increase in the number of passing scores of 8/10 or greater from the baseline to the mid-term survey: 33% (33/100) in the mid-term survey versus 19% (17/92) in the baseline survey. Hand washing was most frequently reported before cooking in both surveys. Hand washing was most frequently reported after defecating during the mid-term survey, and before cooking during the baseline survey. Hand washing was least reported after cleaning a child's bottom during both surveys. During the mid-term survey, 100% (101/101) of the women used water to wash their hands and 81% (82/101) used soap. For most parameters, the mid-term results for hand washing knowledge and behavior improved from the baseline survey while hand washing behavior remained about the same in the baseline survey.

Table 3.1.2.7 Household Food Preparer Hand Washing Knowledge and Behavior
Honduras - Study Area 2 - Marcovia, February 2001

Household Food Preparer		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	60% (55/92)	**79% (81/102)**
	Before cooking	78% (72/92)	**75% (76/102)**
	Before feeding children	32% (29/92)	**31% (32/102)**
	After defecating	60% (55/92)	**81% (83/102)**
	After cleaning child's bottom	12% (11/92)	**11% (11/102)**
How do you wash your hands? (behavior)	Use water	100% (92/92)	**100% (101/101)**
	Use soap	72% (66/92)	**81% (82/101)**
	Use both hands	97% (89/92)	**96% (97/101)**
	Rub hands. 3 times	84% (76/91)	**90% (91/101)**
	Dry hands on towel or air dry	32% (31/92)	**54% (55/101)**
Total passing score (8 of 10)		19% (17/92)	**33% (33/100)**

≥ greater than or equal to

People living in households where there are no children will be less likely to report hand washing activity before or after interaction with children. However, no differences in scoring were made to account for the fact that people who do not live with young children would be less likely to think of these answers than those living with young children. Therefore, the overall hand washing scores of primary child caregivers and food preparers in households with children less than three years of age and households with no children less than three were compared. For the primary child caregiver, 53% (20/38) of those with children less than three years old had a passing hand washing score compared to 0% (0/64) of households with no children less than three. Results for the food preparer were similar with 50% (19/38) of households who had children less than three years old receiving a passing score, compared to 22% (14/64) of food preparers with no children less than three years old receiving a passing score. Results between

the two groups demonstrate that primary child caregivers and food preparers with children are more likely to have a passing hand washing score than those who do not have children.

Hand Washing Education
The ARC conducted a majority of the health education workshops (charlas) focusing on hand washing behavior that were reported by the study participants in the mid-term survey. The mid-term survey showed that 44% (41/93) of households reported receiving a charla on proper hand washing behavior. This is an increase from the baseline survey, in which 21% (19/91) of the households received a charla (Figure 3.1.2.2), and the majority of charlas were given by the Centro de Salud (Salud Publica). Most charlas in the mid-term survey were given at the home or at the local school with the female head of household or with groups of people from the community.

The results showed that 50% (13/26) of the primary child caregivers and 38% (20/52) of the food preparers who received a charla on hand washing had a passing hand washing score. For those who did not receive a charla, only 15% (7/48) of the primary child caregivers and 27% (13/48) of the food preparers had a passing hand washing score (Figure 3.1.2.2).

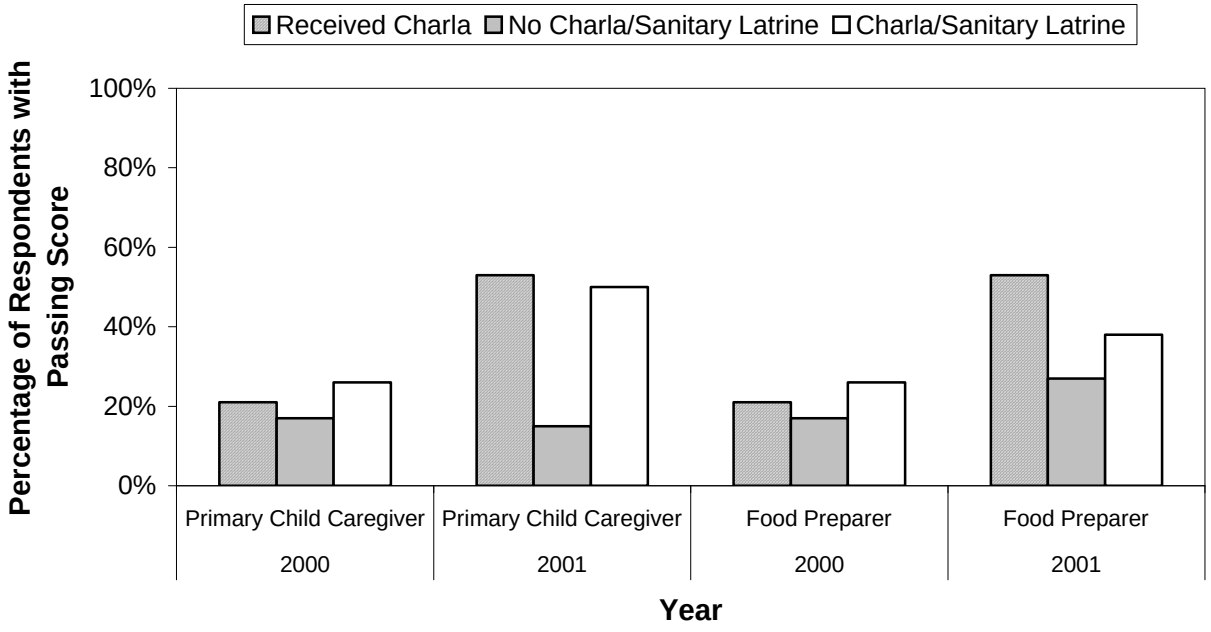

Figure 3.1.2.2 Comparison of Health Education and Hand Washing Scores
Honduras – Study Area 2 - Marcovia, February 2001

Percentage of population using hygienic sanitation facilities
Proper disposal of excreta is essential to protect the health of the community members, particularly children. This indicator focuses on the percentage of the population that used hygienic sanitation facilities, where a sanitation facility is defined as a functioning toilet or latrine where excreta are disposed. This indicator was met if the facility was hygienic and used by household members greater than 12 months of age.

A facility was considered hygienic if there were less than three flies present and no excreta were found outside the latrine. It was considered in use if the latrine had one or more of the following conditions: it had been recently cleaned with water, there was a path to the latrine, there were signs of recently being swept, there were signs of recent repair, and there were no spider webs.

Use of Hygienic Facilities

Table 3.1.2.8 is a summary of the characteristics of the sanitation facilities. The number of people using a latrine increased during the mid-term survey compared to the baseline survey. Additionally, the number of hygienic latrines that in use and the number of people who using hygienic facilities increased. More of the study participants disposed of a baby's waste in a latrine during the mid-term survey than during the baseline survey and less people disposed of waste in places other than a latrine. A hand washing area, on average, was located much closer to a latrine during the mid-term survey (13 m) than during the baseline survey (51 m).

Table 3.1.2.8 Sanitation Facility-Use and Practice
Honduras - Study Area 1 - Marcovia, February 2001

Sanitation Facilities	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Total population >12 months using a latrine	31% (137/444)	**91% (426/470)**
Latrines that are hygienic and in use *	45% (10/22)	**89% (85/96)**
Population >12 months of age using a hygienic* latrine	15% (65/444)	**77% (363/470)**
Dispose of baby's** waste in a latrine	14% (4/21)	**61% (17/28)**
Dispose of baby's waste not in a latrine	86% (18/21)	**18% (5/28)**
Mean distance to hand washing area	51 m	**13 m**

* Hygienic if <3 flies present and no excreta are found outside the latrine. In Use if latrine has one or more of the following, recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
** baby defined as a child less than 12 months of age
>greater than

Education on Care and Use of Latrines

The ARC conducted a majority of the health education workshops (charlas) focusing on the care and use of latrines that were reported by the study participants. Sixty-nine percent (70/102) of households reported receiving a charla on the care and use of latrines during the mid-term survey an increase from the baseline survey, in which 23% of the households received a charla (Figure 3.1.2.3), and the majority of charlas were given by the Centro de Salud (Salud Publica). Most charlas in the mid-term survey were given at the local school or in the home to the community or the female head of household.

The mid-term results showed that 84% (59/70) of the survey participants who had received a charla on the care and use of latrines of latrines had hygienic latrines. Eighty-one percent (26/32) of those who did not receive a charla had hygienic latrines (Figure 3.1.2.3).

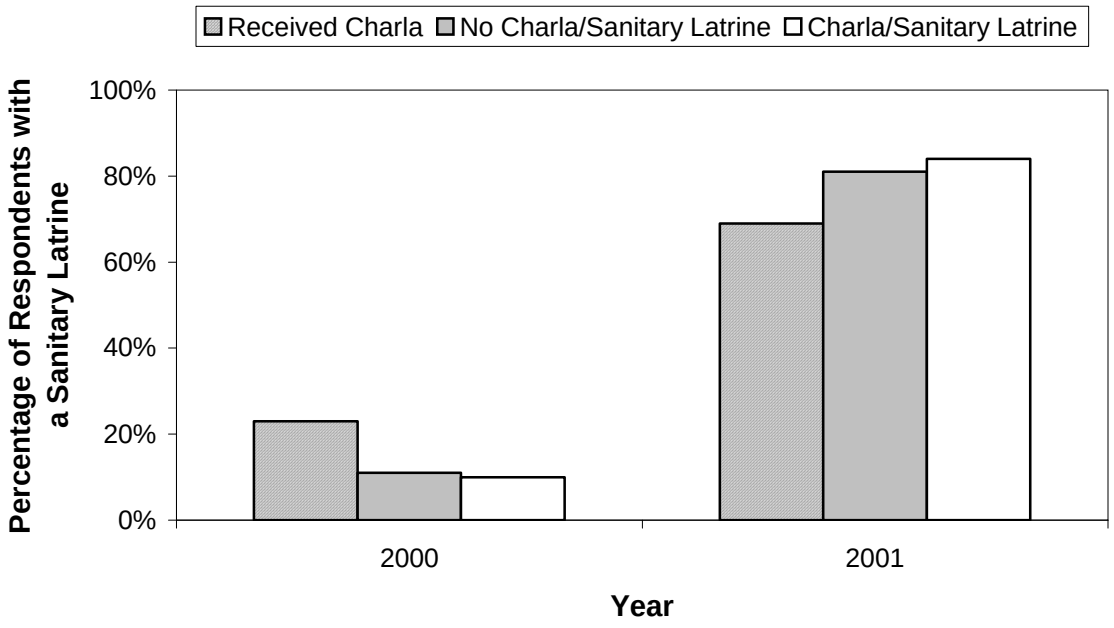

Figure 3.1.2.3 Comparison of Health Education and Sanitary Latrines
Honduras – Study Area 2 - Marcovia, February 2001

Monitoring Indicators

Percentage of households with year-round access to water

This indicator is a measure of the homes that are directly connected to a piped system or that have an adequate public private or shared water source that is located within 200 meters of the home and is used for drinking, cooking, cleaning, and bathing. No particular level of water quality is implied. Water sources defined as "adequate" may include wells and springs, but do not include untreated surface waters.

In the mid-term survey, the percent of households reported by the interviewers to have year-round access to a water source and located within 200 m of an improved water source was 72% (73/102). This increased from the baseline survey of 54% (49/91). This indicates that most households were within the 200 m distance requirement to an improved water source. The average distance to an improved water source in the baseline survey was 45 m versus the mid-term survey at 6 m. The water source in Marcovia is a private spigot and considered adequate.

The distance households traveled in the mid-term survey to get to their water source ranged from 0 meters (m) to greater than 1 kilometer (km), with a mean distance of 21 m. A reported distance of 0 m indicates that a water source is located at the home. The median distance traveled to get water was 3 m. Prior to Hurricane Mitch, households reported traveling on average 192 m to get water (median 4 m) with a range of 0 meters to 7 km. The median distance traveled to get water after Hurricane Mitch increased from 4 m to 30 m at the time of the baseline survey. During the mid-term survey the distance decreased to 3 m.

Interviewer estimates of distance from the interviewed household to its water source in the mid-term survey were about the same at the estimates of the interviewees (i.e., mean distance of 16 m and a median distance of 4 m versus the interviewees at 21 m, with a median distance of 3 m). As shown in Table 3.1.2.9, at the time of the baseline and mid-term surveys the volume of water collected appeared to have no association with the distance from the household to the water source.

Table 3.1.2.9 Daily Volume of Water Collected in Relation to Distance from Household to Water Source
Honduras - Study Area 2 - Marcovia, February 2001

Distance (meters)	Number of households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=91	**2001 N=96**	2000	**2001**	2000	**2001**	2000	**2001**
≤ 10	33	**91**	11-912	**0-999**	350	**326**	262	**247**
11-50	16	**2**	38-494	**38-999**	220	**519**	222	**519**
51-100	9	--	17-254	--	146	--	152	--
101-200	10	**1**	0-228	**46**	99	**46**	72	**46**
201-500	20	**1**	7-425	**420**	137	**420**	109	**420**
501-998	1	--	57	--	57	--	57	--
≥ 999	2	**1**	60-209	**34**	135	**34**	135	**34**

≤ less than or equal to
≥ greater than or equal to

Percentage of households with access to a sanitation facility

Households were considered to have access to a sanitation facility if that household had a private facility or shared a facility with others in a community. During the mid-term survey, the percentage of households that reported having access to a sanitation facility increased to 95% (97/102) from 27% (22/83) during the baseline survey (Table 3.1.2.10). All respondents to the mid-term survey owned private facilities, and these were primarily pour flush latrines. During the baseline survey the participants also had mostly private facilities, but the majority of the facilities were dry pit latrines (Table 3.1.2.10).

Table 3.1.2.10 Household Access and Description of Sanitation Facilities
Honduras – Study Area 2 – Marcovia, February 2001

Sanitation Facility	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Those who have access	27% (22/83)	**95% (97/102)**
Number of latrines inspected	22	**96**
Private facility	91% (20/22)	**100% (97/97)**
Shared facility	9% (2/22)	**0% (0/97)**
Dry pit latrines	82% (18/22)	**19% (19/96)**
Pour flush latrines	18% (4/22)	**76% (77/96)**

Percentage of recurrent costs for water supply services provided by the community served

This indicator cannot be assessed until the water supply interventions are completed.

Percentage of constructed water supply systems operated and maintained by the communities served

This indicator cannot be assessed until the water supply systems are completed in all study areas.

Water Quality Testing

The results of the analyses of the community water source and household water samples are summarized in Table 3.1.2.11. All water samples were analyzed using the portable DelAgua Water Testing Kit and total coliforms and *E. coli* were quantified and reported as colony forming units per 100 ml of water (CFU/100 ml). A subset of samples was analyzed in duplicate using the DelAgua kit, and a subset of samples was analyzed by a qualitative test using the PurTest kit to confirm the presence or absence of total coliforms and *E.coli*. A sterile water blank was analyzed with each batch of samples to verify that sterile conditions were being maintained.

Table 3.1.2.11 Community and Household Water Sources Receiving Treatment and Coliform Results
Honduras - Study Area 2 - Marcovia, February 2001

Water Tested	Sample Size (N)		Water Treated		Percent of Samples Positive for Total coliforms		Percent of Samples Positive for *E. coli*	
	2000	**2001**	2000	**2001**	2000*	**2001**	2000	**2001**
Community source	1	**3**	0% (0/1)	**0% (0/3)**	0% (0/1)	**100% (3/3)**	0% (0/1)	**67% (2/3)**
Household samples	13	**8**	13% (1/8)	**63% (5/8)**	85% (11/13)	**100% (8/8)**	31% (4/13)	**63% (5/8)**

*Results reported in the baseline survey are fecal coliforms.

Community Water Source

The community water source was a water tank that was fed by a groundwater well and is connected a distribution system to which all households are connected with private yard taps.

In the mid-term survey, coliform bacteria were found in the community water tank and in the community well. The results of the quantitative analysis using the DelAgua Water Testing kit for the community well were 138 CFU of coliform bacteria/100 ml and 0 CFU of *E. coli*/100 ml. In the water tank, total coliform bacteria were TNTC and *E. coli* was present at 10 CFU/100 ml.

Water samples taken from the community well the baseline survey were sent to the Ministry of Health laboratory where samples were analyzed for fecal coliform bacteria and *E. coli* using membrane filtration, a standard quantitative method. There were no fecal coliforms or *E. coli* present in the community well at the time of the baseline survey.

Household Water Samples

During the mid-term survey, water samples were taken from water stored in 8 households for drinking. As shown in Table 3.1.2.11, 100% (8/8) of samples contained total coliforms and 63% (5/8) were positive for *E. coli.* The positive samples ranged from 610 CFU/10 ml to TNTC for total coliform bacteria and from 20 CFU/10 ml to 370 CFU/10 ml for *E. coli*. Three household samples contained total coliforms but no *E. coli*.

Sixty-three percent (5/8) of households reported treating their water on the day of the interview. The stored water in each of these households was contaminated with total coliforms and 80% (4/5) were positive for *E. coli*. Each of the remaining three households that did not treat their water on the day of the interview contained total coliforms and 33% (1/3) contained *E. coli*.

The percentage of samples testing positive for total coliforms or *E. coli* during the mid-term survey was compared to the percentage testing positive during the baseline survey. The results show that most household water samples were contaminated with total coliform bacteria and *E.coli*, and that the community well was free of *E. coli* contamination during both the baseline and the mid-term surveys, but contained total coliform bacteria during the mid-term survey. Because the analysis during the baseline survey did not include total coliform bacteria, this comparison does not provide information about whether the well was contaminated with total coliforms at the time of the baseline survey, or had become contaminated at some time between the baseline and mid-term surveys.

Quality Assurance

One water sample was analyzed in duplicate using the DelAgua kit, and identical results were obtained for the duplicate samples. No bacteria grew in the sterile water blanks analyzed, indicating that sterile conditions were adequately maintained during processing of the water samples.

The results of the confirmatory sample analysis using the PurTest kit were not in agreement with the results found using the DelAgua kit. The community water tank was tested using the PurTest kit, and the results were negative for the presence of total coliform bacteria and *E. coli*. Conversely, the DelAgua test kit results were TNTC for total coliforms and 10 CFU *E. coli*/100 ml. One household water sample was analyzed using the PurTest Kit and showed positive results for total coliforms and negative results for *E. coli*. The results of the DelAgua kit for this sample showed TNTC total coliforms and 20 CFU/10 ml *E. coli*. Unfortunately, time limitations did not allow for investigation of the discrepancies between the two water quality tests.

Storage, Handling and Treatment

A summary of the way water is stored, handled and treated in the home is shown in Table 3.1.2.12. Water in the home was stored, handled and treated similarly in the mid-term and the baseline survey. However, more people covered their drinking water during the mid-term survey. More study participants dipped a cup into the storage container to obtain drinking water, and fewer study participants poured their drinking water from the storage container. Study participants used better water treatment practices during the mid-term survey. Twice as many study participants reported treating their water on the day of the mid-term survey, more people always treated their water and fewer people were found to sometimes or never treat their water. The percentage of people who treated household water with chlorine increased during the mid-term survey, when compared to the baseline.

Table 3.1.2.12 Summary of Water Storage, Handling and Treatment
Honduras – Study Area 2 – Marcovia, February 2001

Technique	Baseline Survey 2000	**Mid-term Survey 2001**
Storage and Handling		
Store water at home	97% (89/92)	**98% (100/102)**
Stored drinking water	96% (88/92)	**99% (101/102)**
Covered drinking water	88% (79/90)	**99% (100/101)**
Dip in a cup for water	46% (42/91)	**66% (67/101)**
Pour water into a cup/glass	35% (32/91)	**26% (26/101)**
Treatment		
Treated water day of survey	26% (24/92)	**57% (58/102)**
Always treated their water	23% (21/92)	**57% (58/102)**
Sometimes treated their water	32% (29/92)	**23% (23/102)**
Never treated their water	46% (42/92)	**21% (21/102)**
Treat water with chlorine	48% (44/91)	**92% (79/86)**
Treat water by boiling	7% (6/91)	**4% (3/86)**

Water Treatment Education

The Red Cross conducted a majority of the health education workshops (charlas) focusing on proper storage and treatment of water reported by the study participants in the mid-term survey, whereas the Centro de Salud (Salud Publica) conducted a majority of the health education charlas during the baseline survey. The survey showed that 63% (64/102) of the households reported receiving a charla on how to treat household water during the mid-term survey, compared to 40% (36/91) of the households during the baseline survey. Most of the charlas reported during the mid-term survey were given in the home or at the local school to the female head of household or the community.

No apparent difference was seen in the prevalence of observed water-related activities between study participants who did and did not receive a charla on proper storage, handling and treatment of household water. Figure 3.1.2.4 summarizes the observed activities for those who did or did not receive charlas on the storage and handling of household water.

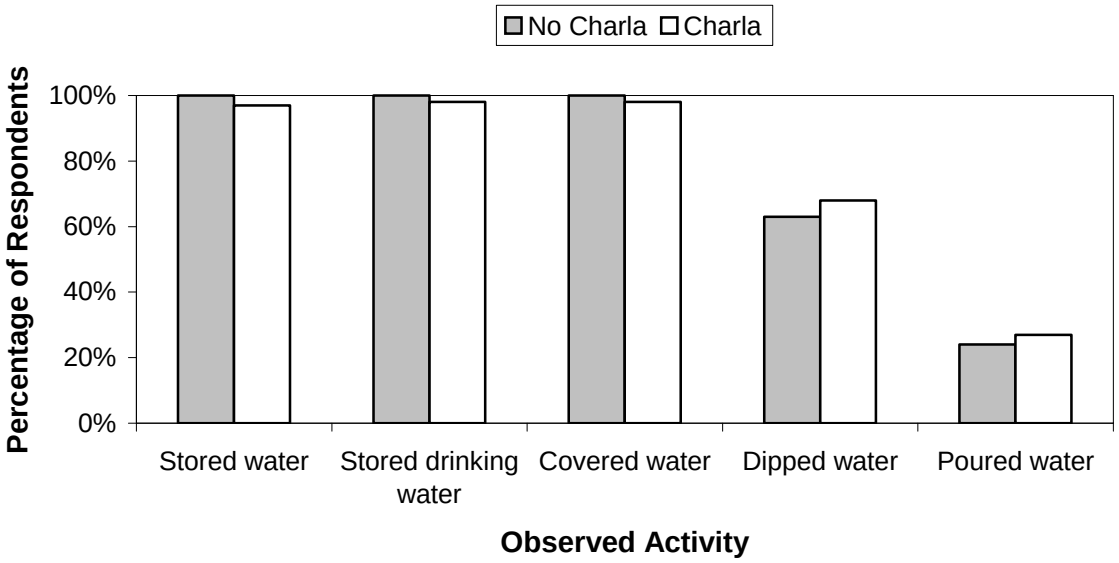

Figure 3.1.2.4 Water Storage Activities Observed by Interviewer in Relation to Receiving a Charla on Proper Storage and Handling of Water
Honduras – Study Area 2 – Marcovia, February 2001

Figure 3.1.2.5 summarizes the reported activities of those who did and did not receive a charla on water treatment. More respondents who received a charla reported treating their water on the day of the survey, 66%, compared to only 42% of those who had not received a charla, and 86% of respondents receiving a charla treated their water either always or sometimes, compared to 68% of those not receiving a charla. Water was primarily treated using chlorine by both those who did and did not receive a charla, 96% (54/56) with a charla and 83% (25/30) without a charla. A small number of study participants boiled their water during the mid-term survey, regardless of whether they had received a charla on water treatment. The results show that those who received a charla were more likely to treat their water the day of the survey and treat household water either always or sometimes, most probably with chlorine.

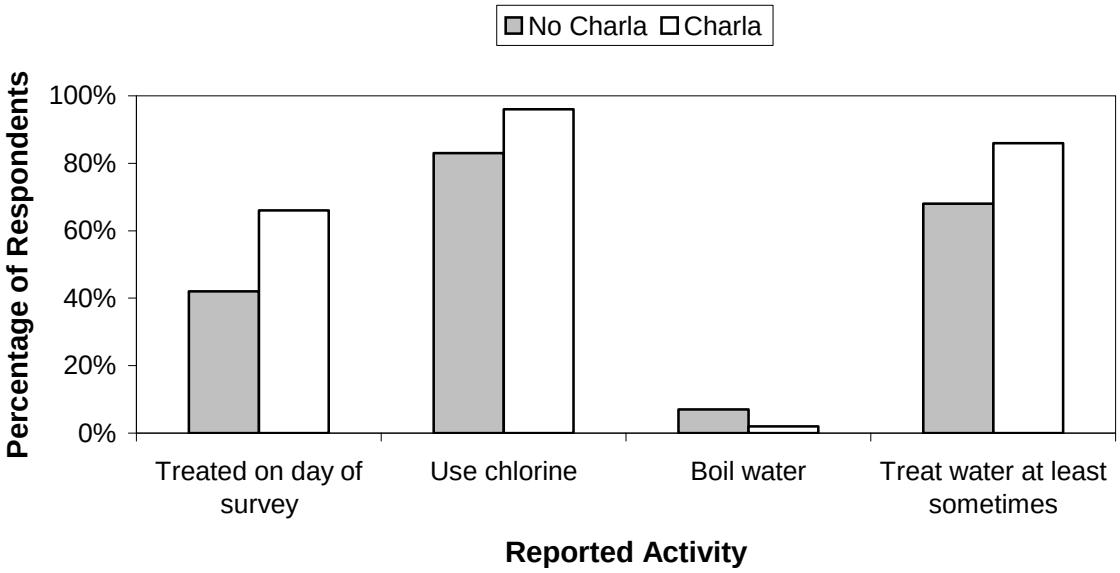

Figure 3.1.2.5 Water Treatment Activities Reported by Study Participants in Relation to Receiving a Charla on Proper Treatment of Water
Honduras – Study Area 2 – Marcovia, February 2001

A water sample was taken from one household that reported receiving education on proper water treatment. The stored water from this household tested positive for total coliform bacteria and *E. coli*. Household water samples were also taken from four households that reported that they had received no education on proper water treatment techniques, but where the water was reported to be treated on the day of the survey. Three of the four homes' stored water tested positive for total coliform bacteria and *E. coli*.

Discussion

The baseline and mid-term survey USAID Impact Indicators in Las Lomas are summarized in Table 3.1.1.13. Comparison of these data shows that the interventions are improving the health of the community and their access to and use of water and sanitation facilities. It should be recognized that the interventions are in progress and the final survey in February 2002 will clearly define the impact of the interventions on this community. Nevertheless, at the time of the mid-term survey, goals were already met for four of the seven indicators.
The baseline and mid-term survey USAID Impact Indicators in Marcovia are summarized in Table 3.1.2.13. Comparison of these data shows that the interventions are improving community access to and use of water and sanitation facilities. It should be recognized that the interventions are in progress and the final survey in February 2002 will clearly define the impact of the interventions on this community. Nevertheless, at the time of the mid-term survey, goals were already met for four of the seven indicators.

Table 3.1.2.13 Performance Indicators
Honduras - Study Area 2 - Marcovia, February 2001

Performance Indicator	USAID Guideline	Status During Baseline Survey (2000)	Final Goal (2002)	Status During Mid-term Survey (2001)	Percent Difference : Baseline to Mid-term[1]	Progress To Goal: Baseline to Mid-term[2]	Status Relative to Final Goal[3]
Impact Indicator							
Children under <36 months with diarrhea in the last 2 weeks[4]	25% decrease	29 (13/45)	≤24	29 (13/45)	0% decrease	NA	0%
Quantity of water used per capita per day	100% using 50 Lpd	29% 26/90)	100%	50% (51/101)	NA	21% increase	50%
Child caregiver with appropriate hand washing behavior	50% increase	19% (17/92)	≥29%	50% (20/40)	163% increase	NA	>100%
Food preparers with appropriate hand washing behavior	50% increase	19% (17/92)	≥29%	33% (33/100)	74% increase	NA	>100%
Population using hygienic sanitation facilities[5]	75% usage	15% (65/444)	≥75%	77% (363/470)	NA	62% increase	>100%
Monitoring Indicator							
Households with year-round access to water[6,]	NE	54% (49/91)	100%[7]	72% (73/102)	NA	18% increase	72%
Households with access to a sanitation facility	NE	27% (22/83)	100%[7]	95% (97/102)	NA	68% increase	95%

1 Calculated ONLY for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values

2 Calculated ONLY for indicators with goals with an absolute goal (e.g., 100%) by subtracting the baseline value from the mid-term value

3 Status with respect to the final goal for each indicator, calculated for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values divided by the goal, calculated for those with an absolute goal (e.g., 100%) by dividing the mid-term value by the goal; >100% indicates that the goal was exceeded

4 Goal is a reduction in the number of cases of diarrhea per 100 children in the study population.

5 A facility is considered hygienic if there are less than 3 flies present and no excreta are found outside the latrine. A latrine is IN USE if latrine it has one or more of the following conditions: recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.

6 Water source is less than 200 meters away from the household and there is access to water year-round.

7 Goal was established by the American Red Cross

NE none established

Impact Indicators

The overall period prevalence diarrhea in children less than 36 months during the mid-term survey remained the same as the period prevalence reported during the baseline survey. Diarrhea prevalence is related to all sectors addressed by the ARC water and sanitation interventions: water quality and availability, availability and use of hygienic sanitation facilities, and use of appropriate hygiene practices. It is surprising that the prevalence of diarrhea did not decrease from the baseline survey to the mid-term survey, because the interventions in Marcovia were nearly complete at the time of the mid-term survey. However, site-specific factors probably contributed to the lack of change in the prevalence of diarrhea in children less than 36 months of age in this community. If the chlorination system on the water tank had been operational, it most likely would have contributed to a reduction in diarrhea. Additionally, the community water board operates the water pump for a limited time each day to control electrical consumption. Thus, water has to be stored for household use, just as before the household taps were installed. Therefore, some community members may not believe that sufficient water is available to allow them to use water for hand washing after using the latrine or before preparing meals, and the stored water may become contaminated through contact with dirty hands or dishes (cups to dip water out of containers), or the containers themselves may not be clean.

Additionally, although sanitation and hygiene education has been provided to the segment of the community assisted by ARC, the same basic sanitation and hygiene education has not been provided to all households in the larger Marcovia community. The children from all sections of the community attend the same schools, where diarrhea disease may spread quickly among the school-aged children and subsequently infect the younger children at home. To improve hygiene conditions in the entire community, education programs need to be coordinated with NGOs in the other parts of Marcovia, and educational activities in the schools need to be supported.

With the installation of household taps, significant progress was made toward reaching the goal of 100% of the population obtaining 50 L water per person per day for household use. The percentage of households that obtained 50 L water/person/day or greater increased from 29% during the baseline survey to 50% during the midterm survey. During the baseline survey, the primary source of water was the ARC-built shared well. The water tank and distribution system were built between the baseline and midterm surveys, so all households had household spigots at the time of the mid-term survey. This indicates that the intervention of providing spigots to households improved the amount of water available to the study participants. However, because the costs associated with running the electrical pump caused the community to limit the amount of water available, people are probably using less water than they would if water were freely available throughout the day.

The average daily water metered volume in households with private or shared spigots was 6,776 L per household, compared to the average self-reported volume of 245 L/day per household, indicating that households may have drastically under-reported their daily use. However, some of the meters and distribution system pipes were known to leak. Thus, it is difficult to fully assess the discrepancy between the metered and reported volumes without further evaluating the community water use patterns and the water distribution system. Actual time spent waiting for water differed between surveys.

The percentage of people who reported having to wait for decreased from 88% during the baseline survey to 5% during the mid-term survey. This improvement is due to the provision of private spigots for all households. More people were also likely to wash their clothes at home versus elsewhere during the mid-term survey, also due to the accessibility of water from private spigots.

More child caregivers and food preparers received charlas and more received passing hand washing scores during the mid-term survey than the baseline survey. The knowledge of when to wash their hands increased in all categories for the primary child caregiver and the food preparer, and knowledge of proper hand washing technique increased slightly between surveys. The primary child caregiver and food preparer may be the same person in some cases that may be a reason for similar results. The impact indicator goal of a 50% increase in the number of child caregivers and food preparers who passed the hand washing test between the baseline and the final survey was exceeded during the mid-term survey, indicating the success of the educational programming focusing on proper hand washing behavior.

The goal that 75% of the population use hygienic sanitation facilities was met during the mid-term survey. The percentage of households reporting access to a latrine increased by 2.5 times between the baseline and mid-term surveys, and the percentage of the population that use of hygienic latrines increased fourfold from the baseline survey to the mid-term survey, to 77%. The percentage of households that reported receiving training on the care and use of latrines increased from 23% during the baseline survey to 69% during the mid-term survey. Households that participated in educational training about proper care and use of latrines were slightly more likely to use hygienic latrines than those who had no training. However, the 2.5-fold increase in the availability of latrines and the conversion from pit latrines to more culturally acceptable

pour-flush latrines probably had a more significant impact on the use of hygienic sanitary facilities by the people of Marcovia.

Monitoring Indicators

At the beginning of the intervention process, ARC had set a goal of providing 100% of the community with an improved water source. During the baseline survey, 71% of households depended on the centrally located ARC well operated using a hand pump to obtain their water, and 75% of all participants' water sources were located within 200 m of their households. The improvements made by ARC to the water system between the baseline and mid-term surveys provided 98% of the households in the study population with access to an improved water source (i.e., private household spigots). The two households that did not have access to an improved water source at the time of the mid-term survey had not yet moved into the resettlement community. These families may ultimately decide not to move into the community, and if they do not, they will not receive the benefits associated with the community. Therefore, although the target community, and thus the study population, consists of all families who had originally planned to move to Marcovia, the ARC goal of providing the target community with 100% access to an improved water source is impractical in this community. ARC, by providing 98% of the population with access to an improved water source, achieved excellent coverage of the target population.

ARC also set a goal to provide 100% of the target community access to a sanitation facility. ARC had provided pour-flush latrines at each household in Marcovia by the time of the mid-term survey and had achieved 95% access to those participating in the survey. Again, the goal of 100% coverage was not fully met because some of the households had not yet moved to the resettlement community, and it may not be met in the future if the families decide not to move to the resettlement community. However, 95% coverage of the target population with access to sanitation is again an excellent achievement of the purpose of the intervention.

In future interventions, ARC will need to revise the goals for these two monitoring indicators to more realistic levels, taking into account social (e.g., refusal to take part, mobility) and technical (e.g., ground too hard to dig a pit) constraints.

Water Quality Analysis

During the baseline study, before the electrical pump had been installed at the well that supplies water to the community of Marcovia, the well water tested negative for total coliforms and *E. coli*. At the mid-term survey, however, the well water and water storage tank in Marcovia, which served 76% of the participating households was contaminated with these indicators of fecal contamination. The system in Marcovia probably became contaminated during construction of the delivery system from the well to the tank. At the time of the mid-term survey, the chlorinator had not yet been installed at the water tank, so water contaminated with *E. coli* was being distributed to the community. The use of this contaminated water for drinking, washing, and household chores may have affected the diarrhea rates in children less than 36 months of age, which remained constant in the baseline and mid-term surveys. Periodic testing, cleaning and disinfection of the well and tank are included in the operation and maintenance plan for the system, and ARC has provided appropriate training to the water committee to carry out these tasks.

Recommendations

The results of this study showed that as the ARC water and sanitation interventions are being implemented, the proposed goals for the Impact Indicators were already met except for the prevalence of diarrhea in children less than 36 months of age. The Monitoring Indicators had a goal of 100% for households having access to an improved water source and 100% access of households to a sanitation facility. The Monitoring Indicators improved from the baseline to the mid-term survey and are likely to be attained by the time the final survey is completed in 2002. The ARC interventions completed so far have been effective in increasing access to water and hygienic sanitation facilities and teaching effective hand washing techniques. The CDC recommends that the ARC continue to focus on completion of the following tasks so that all proposed goals are met by the time the final survey is performed.

Water

At the time of the mid-term survey, the water system was completed. Water meters were installed in select homes. The time spent waiting for water decreased from the baseline, however, water quality testing showed that water in the community tank contained *E. coli*. The CDC recommends that the ARC assist the community in establishing a water quality monitoring program for the community water system and to chlorinate the water when positive results are obtained from this water source.

Sanitation

Household latrines were constructed and nearly 100% of the survey participants reported access to a pour-flush latrine at the time of the mid-term survey. The CDC recommends that the availability of latrines be confirmed to ensure that latrines are available to those who do not have access to one already. Health education should also continue to improve care and use of latrines.

Hand Washing Behavior

The CDC recommends that the ARC continue with health education to improve personal hygiene to improve the impact indicator for diarrhea in children less than 36 months of age.

Water Quality Testing

The results from water quality testing demonstrated that household and community water supplies were contaminated with *E. coli*, and suggest the following recommendations:

- The community water supply should be monitored and treated with chlorine to ensure that clean water is distributed to the residents of Marcovia.
- Results showed that even when education was provided, household samples tested positive for *E.coli*. Education on water treatment and care should continue throughout the community to ensure that household water is handled appropriately.

Nicaragua

Study Area 1 - Nueva Segovia

The baseline survey was conducted in Nueva Segovia on February 7-8, 2000 with a team of eleven interviewers, the ARC in-country water and sanitation delegate and supervisor, and one CDC investigator. There were 120 households in the resettlement communities of Dipilto Nuevo and Dipilto Viejo with a population of 550 people. A census of the inhabited houses was taken and 101 interviews were conducted. There was close to universal participation in the survey with 95% (101/106) of contacted households agreeing to participate.

In 2001, a team of eight interviewers, two ARC in-country health delegates, and one CDC investigator traveled by bus from Managua to Nueva Segovia. There were again 120 households in the Dipilto Nuevo and Dipilto Viejo, with a population of 550 people. As in the previous year, a census was conducted in the two communities: 54 households in Dipilto Nuevo and 50 households in Dipilto Viejo. Upon arrival to the center of town, the interviewers were assigned sections of the community in which to conduct interviews. Water samples from four community water sources and from 11 randomly selected households where interviews were being conducted were collected and analyzed for indicators of fecal contamination. There was again excellent participation in the survey, with 95% (104/110) of the contacted households agreeing to participate. Thirty nine percent (40/104) of the households reported having participated in the study the previous year.

Community Description

A community survey was completed with members of the water councils for the two communities on the day of the assessment to obtain general information about the communities and their water-use practices. The president of the town council was not available on the days information was gathered.

Dipilto Nuevo and Dipilto Viejo are located in the state of Nueva Segovia in Nicaragua. They are located in a mountainous region near the border with Honduras. There is a paved road that runs between the two communities, although the same town council coordinates services for both. The people in Dipilto Nuevo and Dipilto Viejo were affected by Hurricane Mitch and have been working to rebuild their community. Most of the people currently living in the resettlement communities are originally from the area. The primary occupations are agriculture and construction. The majority of the population has at least a fourth grade education. Community leaders indicated that the principal need of the community was to find employment for the population.

Demographic Information

The mean household size during the mid-term survey was 5.3 people per household, which was the same as the household size in the baseline survey. In both the baseline and mid-term survey, the average household had less than 1 child younger than 36 months of age. The percentage of study participants who lived in their own homes increased from 81% (82/101) in the baseline

survey to 93% (97/104) in the mid-term survey. During the baseline survey, 8% (8/101) lived with family or friends and 7% (7/101) lived in temporary housing, but by the time of the mid-term survey only 2% (2/104) lived with family and friends and 2% (2/104) lived in temporary housing.

Education

The mean educational level reported in the mid-term survey was 3.9 years, which was a slight increase from the 3.4 years reported in the baseline survey. In the mid-term survey, the interviewee's level of education was reported from 0 to 16 years of formal education, but 30% (31/102) of interviewees had no formal education, and 29% percent (30/102) of interviewees had completed at 6 years of education. In the baseline survey, 25% (25/101) had no formal education and 24% (24/101) had completed at least 6 years of education.

Status of Intervention

The interventions planned by the ARC were community-specific and based on existing resources and needs. Table 3.2.1.1 summarizes the perceived community need before the intervention (i.e., February 2000) and the ARC planned intervention. Additionally, this table lists the status of each intervention at the time of the mid-term survey. At the time the mid-term survey was conducted, the water systems, which had been taken over by the mayor's office and were not ARC projects, had been completed. One of the communities, Dipilto Nuevo, had an ARC latrine project that was completed in May 2000, and the other community, Dipilto Viejo, did not have a latrine project. In Dipilto Viejo, each family was responsible for building their own latrines. Community leaders in Dipilto Nuevo reported that there was no health education classes in their community and those in Dipilto Viejo reported that Ayuda Popular Norega had held seven health education classes during the past year.

Table 3.2.1.1 Community Needs, Planned Interventions and Status of Interventions
Nicaragua- Study Area 1- Nueva Segovia, February 2001

Country/ Study Area	Perceived Community Need	Planned Intervention	Status of Intervention as of February 2001
Nicaragua -Nueva Segovia	Reconstruct water system	• More household/shared spigots ♦ Improve access to latrines + Education program-hygiene, water use, sanitation	• Two water systems installed, one by the municipality, one by ARC ♦ Constructed in one community. Other community does not have latrine project. + Hygiene and sanitation education started in Jan. 2001 by ARC

Performance Indicators

Impact Indicators

Percentage of children under <36 months with diarrhea in the last two weeks

Table 3.2.1.2 summarizes the reported diarrhea prevalence and breast-feeding practice among children less than 36 months of age in the two weeks prior to the baseline and mid-term surveys.

Table 3.2.1.2 Diarrhea Prevalence and Breast-feeding Practice in Children
Nicaragua - Study Area 1 - Nueva Segovia, February 2001

Age	Period Prevalence of Diarrhea* (per 100 children)		Percent of Children Breast-fed		Period Prevalence of Diarrhea Breast-feeding (per 100 children)		Period Prevalence of Diarrhea Not Breast-feeding (per 100 children)	
	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
6 months	27 (4/15)	**29 (2/7)**	67% 10/15)	**71% (5/7)**	10 (1/10)	**40 (2/5)**	60 (3/5)	**0 (0/2)**
7-12 months	42 (5/12)	**10 (1/10)**	75% (9/12)	**89% (8/9)**	33 (3/9)	**13 (1/8)**	67 (2/3)	**0 (0/1)**
13-24 months	33 (8/24)	**8 (2/24)**	42% (10/24)	**54% (13/24)**	63 (5/8)	**8 (1/13)**	21 (3/14)	**10 (1/10)**
25-35 months	0 (0/7)	**14 (3/22)**	29% (2/7)	**55% (12/22)**	0 (0/2)	**8 (1/12)**	0 (0/5)	**20 (2/10)**
< 36 months	29 (17/59)	**13 (8/63)**	53% (31/59)	**62% (38/61)**	18 (9/31)	**13 (5/38)**	29 (8/28)	**13 (3/23)**

* Illness occurred within 2 weeks prior to the survey
< less than
≤ less than or equal to

The period prevalence of diarrhea in children less than 36 months of age was 13 cases per 100 children in the mid-term survey. This was a decrease from the baseline survey, in which there were 29 cases per 100 children had diarrhea. Likewise, there was a decrease between the two years in period prevalence of diarrhea in two age groups (7 to 12 months and 13 to 24 months), but an increase in the other two age groups (less than or equal to 6 months and 25 to 35 months of age). In the mid-term survey, the youngest age group (less than or equal to 6 months of age) had the highest period prevalence of diarrhea, whereas in the baseline survey, the 7 to 12 month olds had the highest period prevalence of diarrhea.

The percentage of children who breast-fed increased from 53% (31/59) in the baseline survey to 62% (38/61) in the mid-term survey. This increase was seen in each of the age groups. The period prevalence of diarrhea in breast-feeding children decreased from 18 per 100 children in the baseline survey to 13 per 100 children in the mid-term survey. There was also a decrease in the period prevalence of diarrhea in not breast-feeding children from 29 per 100 children in the baseline survey to 13 per 100 children in the mid-term survey. During the mid-term survey, the period prevalence for diarrhea was the same for children who were breast-feeding as those who were not breast-feeding (13 per 100 children). However, in the baseline survey, the period prevalence of diarrhea was higher in children who were not breastfeeding than in children who were breastfeeding: 29 per 100 children as compared to 18 per 100 children.

Active Diarrhea Surveillance

Active diarrhea surveillance was conducted with all members of each household that participated in the household survey. The results are provided in Table 3.2.1.2a.

Table 3.2.1.2a Diarrhea Prevalence by Age and Week
Nicaragua - Study Area 1 - Nueva Segovia, February 2001

Age	Diarrhea Prevalence by Week (per 100 people)									
	Weekly Average		Week 1		Week 2		Week 3		Week 4	
Year	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
All ages	2.0	**1.6**	4.2 (20/477)	**1.8 (10/538)**	2.2 (11/492)	**1.1 (6/543)**	1.2 (6/493)	**2.3 (12/519)**	0.4 (2/493)	**1.2 (7/544)**
<36 months	10.7	**9.6**	22.0 (11/50)	**7.5 (4/53)**	13.2 (7/53)	**5.8 (3/52)**	5.7 (3/53)	**17.6 (9/51)**	1.9 (1/53)	**7.5 (4/53)**
5 years	7.8	**5.8**	18.1 (17/94)	**4.5 (5/111)**	8.2 (8/97)	**3.6 (4/110)**	4.1 (4/97)	**11.3 (12/106)**	1.0 (1/97)	**3.6 (4/110)**
18 years	3.6	**2.8**	8.1 (20/246)	**2.5 (7/283)**	3.5 (9/257)	**1.8 (5/280)**	2.3 (6/258)	**4.5 (12/266)**	0.4 (1/258)	**2.1 (6/281)**
65 years	1.1	**2.1**	0 (0/23)	**8.3 (2/24)**	4.3 (1/23)	**0 (0/24)**	0 (0/23)	**0 (0/24)**	0 (0/23)	**0 (0/24)**

< less than
≤ less than or equal to
≥ greater than or equal to

The median age in the mid-term survey was 18 years with a range of less than one year to 90 years old. The median age in the baseline survey was the same, and the range was less than one year to 94 years. There was a similar distribution of males and females during the baseline and mid-term surveys: 48% males in the baseline survey and 50% in the mid-term survey. Weekly diarrhea prevalence ranged from 1.2 per 100 people to 2.3 per 100 people over the four-week period. The highest weekly average was in children younger than 36 months of age and the lowest was in people 65 years old or older. The same age groups had the highest and lowest prevalence in the baseline survey. In the mid-term survey, the prevalence rates peaked in week 3 and then decreased again in week 4. However, in the baseline survey, the prevalence rates decreased from week 1 to week 4.

Quantity of water used per capita per day

The quantity of water used per capita per day is measured as the volume of water collected for each household divided by the number of people in the household. The type of water source and the amount of water used to perform household chores and to bathe impact the per capita daily water use. Water meters were installed prior to the mid-term survey on a subset of household taps to estimate the daily per capita water use of homes with household spigots.

Per Capita Daily Water Use

The calculation of water usage in the participating households was based on self-reported use of water collected and stored in culturally specific water containers. In the mid-term survey, the average volume of water collected per person per day was 29 L (range: 2 to 185 L/person/day). Forty percent (42/104) of the study population collected more than the Sphere guideline of 15 L/person/day and 21% (22/104) collected more than the USAID guideline of 50 L/person/day.

In the baseline survey, the average volume of water collected per person per day was 25 L (range: 0-220 L/person/day). The same percentage of the study population collected more than the Sphere guideline during the baseline survey, but a lower percentage of households (16%, 15/96) collected more than the USAID guideline.

Water Source and Volume Collected

The types and distribution of water sources changed after Hurricane Mitch and at the time of the midterm survey, and are expected to change again once the water interventions have been finalized. Figure 3.3.1.1 summarizes the water sources before Hurricane Mitch, at the time of the baseline survey, and at the time of the mid-term survey.

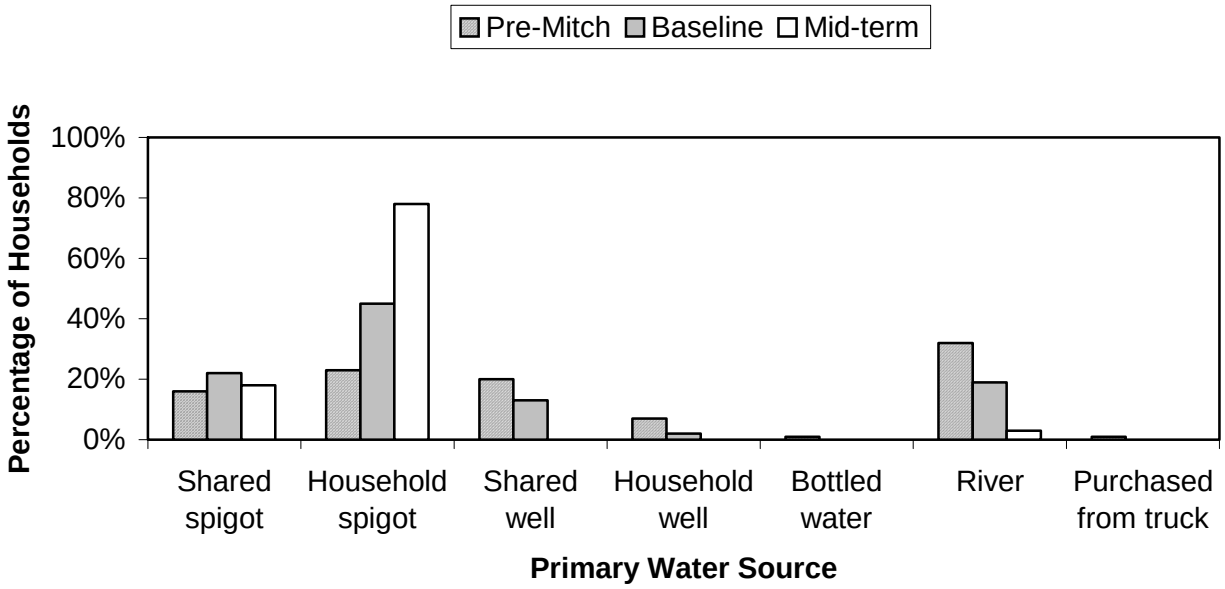

Figure 3.2.1.1 Water Source Before and After Hurricane Mitch and During the Mid-term Survey Nicaragua – Study Area 1 – Nueva Segovia, February 2001

Prior to the hurricane, the majority of water (32% (32/100)) was obtained from the river. At the time of the baseline survey, only 19% (19/101) of households got their water from the river, and the two main sources for water were household spigots (45%, 45/101) and shared spigots (22%, 23/101). By the time of the mid-term survey, 78% (81/104) of participants obtained their water from a household spigot, 18% (19/104) obtained water from a shared spigot, and only 3% (4/104) reported getting water from the river.

The volume of water collected during the baseline and mid-term surveys is shown in Table 3.2.1.3, stratified by water source. Household spigots provided the greatest volume of water during the mid-term survey, with an average of 145 L/day, and the least average volume of water, 116 L/day, was collected from shared spigots. During the baseline survey, participants reported collecting the greatest volume of water from household wells (350 L/day), and the least amount from shared spigots (80 L/day).

Table 3.2.1.3 Daily Volume of Water Collected in Each Household by Water Source
Nicaragua - Study Area 1 – Nueva Segovia, February 2001

Water Source	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
Shared spigot	22	**19**	20-330	**19-475**	80	**116**	50	**57**
Household spigot	42	**81**	0-810	**4-999**	148	**145**	80	**61**
Shared well	13	**0**	10-440	-	112	-	60	-
Household well	2	**0**	40-660	-	350	-	350	-
River/creek	19	**4**	0-440	**42-218**	139	**132**	60	**133**

Water Meter Data

Water meters were installed at households and community water taps to provide an accurate measure of the amount of water used in each home or by a community. Seven household and 1 community meters were installed in this study area. The water meter data was collected from January 24 through February 11, 2001 and provided 18 days of meter measurements. Average daily water use per metered household was 677 L and the average volume of water distributed from the tank was 2421 L. The daily volume of distributed water (2421 L) divided by the number of households that receive water from the distribution system (48 households) results in an average daily volume of 50 L per household.

Table 3.2.1.4 Water Meter Data Summary

Nicaragua – Study Area 1 – Nueva Segovia, February 2001

Type of meter	Number of meters	Number of Metered Households	Range of Daily Water Use (L/day)	Average Daily Volume (L/day)	Median Daily Water Use (L/day)
Household	7	7	0-5000	677	0
Community	1	48	0-83	50	62.5

The mean daily volume of water used per household calculated using the household meter readings, 677 L/d, is 13 times greater than the volume calculated using the community meter readings. There is also a difference between the water meter data and the self-reported data. In the households that have household spigots, the self-reported mean water use 145 L/d compared to the 677 L/d measured by the household meters.

Access to Water

The temporal aspect of access to water was measured as the length of time each day people had to wait to get water and if the water source provides water all year long. Sixty nine percent (72/104) of households in the mid-term survey reported that they had to wait to get water, at least some of the time. Of those who had to wait, 70% (50/71) reported that they had to wait for longer than one hour, while 20% (14/71) said that they had to wait less than 30 minutes. The amount of time spent waiting for water during the mid-term survey increased compared to the baseline survey, during which 51% (32/63) of participants reported waiting for longer than an hour and 24% (15/63) waited for less than 30 minutes. The percentage of people that reported having water all day long decreased from 77% (77/100) during the baseline survey to 17%

(17/103) during the mid-term survey. Likewise, the percentage of people who reported that their primary water source provided water all year long decreased to 70% (72/103) during the mid-term survey, from 83% (83/100) in the baseline survey.

Home Water Use

The home water use variables, summarized in Table 3.2.1.5, include the frequency and sites where participants washed clothes and bathed. During the mid-term survey, households reported washing clothes an average of 6 times a week, which was an increase from 5 times a week reported in the baseline survey. Fewer households reported washing clothes at their home during the baseline survey (49%, 48/99) than during the mid-term survey (64%, 67/104). Most participants who didn't wash their clothes in their homes reported washing them in a river or stream: 43% (43/99) in the baseline survey and 32% (33/104) in the mid-term survey. Ninety five percent (99/104) of households bathed in the same place they washed clothing. During both the baseline and mid-term surveys, 93% (97/104) of interviewees reported that they bathed daily

Table 3.2.1.5 Summary of Household Water Use
Nicaragua - Study Area 1 – Nueva Segovia, February 2001

Home Water Use	Baseline Survey 2000	**Mid-term Survey 2001**
Wash clothes	5 times/week	**6 times/week**
Wash clothes at home	49% (48/49)	**64% (67/104)**
Wash clothes at a neighbor's house	8% (8/99)	**4% (4/104)**
Wash clothes in a river/creek	43% (43/99)	**32% (33/104)**
Bathe where they wash clothes	89% (89/100)	**95% (99/104)**
Bathe daily	93% (93/100)	**93% (97/104)**

Percentage of child caregivers and food preparers with appropriate hand washing behavior

The assessment of appropriate hand washing knowledge and behavior was based on the interviewees' ability to recite critical times at which they wash their hands and to demonstrate good hand washing technique. Proper hand washing is one of the most effective ways to break the fecal-oral route of disease transmission. Hand washing knowledge was self-reported and behaviors were observed and scored by the interviewer. A passing score was eight or more correct responses out of ten (8/10) (Billig, et al., 1999). Unanswered questions were considered a "no" response. The ARC interventions include a health education component that should increase the knowledge and practice of proper hand washing. Hand washing knowledge and behavior of the primary child caregiver and food preparer are shown in Tables 3.2.1.6 and 3.2.1.7.

Primary Child Caregivers

Comparison of the mid-term and baseline surveys shows that there was a slight decrease in the number of passing scores of 8/10 or greater: 33% (32/97) in the baseline survey and 30% (23/78) in the mid-term. Hand washing was most frequently reported before cooking and after defecating for both surveys. Hand washing was least reported before feeding children and after cleaning children's bottoms in both surveys. In the mid-term survey, all of the primary child caregivers used water to wash their hands and 65% (49/75) used soap.

Table 3.2.1.6 Child Caregiver Hand Washing Knowledge and Behavior
Nicaragua - Study Area 1 - Nueva Segovia, February 2001

Primary Child Caregiver		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	54% (51/95)	**46% (36/78)**
	Before cooking	76% (73/96)	**78% (61/78)**
	Before feeding children	35% (34/97)	**42% (33/78)**
	After defecating	75% (73/97)	**78% (61/78)**
	After cleaning children's bottom	23% (22/95)	**19% (15/78)**
How do you wash your hands? (behavior)	Use water	97% (94/97)	**100% (75/75)**
	Use soap	79% (77/97)	**65% (49/75)**
	Use both hands	94% (91/97)	**93% (70/75)**
	Rub hands. 3 times	73% (71/97)	**72% (53/74)**
	Dry hands on towel or air dry	61% (59/97)	**71% (53/75)**
Total passing score (8 of 10)		33% (32/97)	**30% (23/78)**

≥ greater than or equal to

Household Food Preparer

Comparison of the mid-term and baseline surveys shows that there was also a slight decrease in the number of food preparers with passing scores of 8/10 or greater, from 33% (33/100) in the baseline survey to 29% (30/103) in the baseline survey. Hand washing was most frequently reported after defecating in both surveys, and hand washing was least reported and after cleaning children's bottoms in both surveys. In the mid-term survey, all of the household food preparers used water to wash their hands and 60% (59/99) used soap.

Table 3.2.1.7 Household Food Preparer Hand Washing Knowledge and Behavior
Nicaragua - Study Area 1 - Nueva Segovia, February 2001

Household Food Preparer		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	54% (52/96)	**45% (46/103)**
	Before cooking	78% (76/97)	**37% (38/102)**
	Before feeding children	35% (34/97)	**78% (80/103)**
	After defecating	76% (74/97)	**77 % (79/103)**
	After cleaning children's bottoms	21% (20/95)	**18% (19/103)**
How do you wash your hands? (behavior)	Use water	98% (97/99)	**100% (99/99)**
	Use soap	80% (79/99)	**60% (59/99)**
	Use both hands	94% (93/99)	**100% (99/99)**
	Rub hands. 3 times	75% (74/99)	**68% (67/98)**
	Dry hands on towel or air dry	62% (61/99)	**70% (69/99)**
Total passing score (8 of 10)		33% (33/100)	**29% (30/103)**

≥ greater than or equal to

People living in households where there are no children will be less likely to report hand washing activity before or after interaction with children. However, no differences in scoring were made to account for the fact that people who do not live with young children would be less likely to

think of these answers than those living with young children. Therefore, the overall hand washing scores of primary child caregivers and food preparers in households with children less than three years of age and households with no children less than three were compared. There was no association found between having children and hand washing score for either child caregivers or food preparers.

Hand Washing Education

The American Red Cross, the Nicaraguan Red Cross, and the Dutch Red Cross conducted a majority of the health education workshops (charlas) focusing on hand washing behavior that were reported by the study participants in the mid-term survey. The mid-term survey showed that 63% (65/104) of households had received a charla on proper hand washing behavior (Figure 3.2.1.2). This is an increase from the baseline survey, in which 44% (42/96) of the households had received a charla, which were principally provided by the Ministry of Health.

Most of the child caregivers who received a charla (47/65) did not receive a passing score in hand washing. However, the child caregivers that received a charla on hand washing had higher scores than those that did not. Twenty eight percent (18/65) of the child caregivers who received a charla had a passing score as compared to only 13% (5/39) of the child caregivers who did not receive a charla who had a passing score. This same trend of a higher percentage of child caregivers who received a charla having a passing score was seen in the baseline survey.

Most of the food preparers who received a charla (42/65) did not receive a passing score. However, the food preparers that received a charla on hand washing had higher scores than those that did not. Thirty five percent (23/65) of the food preparers who received a charla got a passing score as compared to 18% (7/39) of the food preparers who did not receive a charla but who had a passing score. This same trend of a higher percentage of food preparers who received a charla having a passing score was seen in the baseline survey (Figure 3.2.1.2).

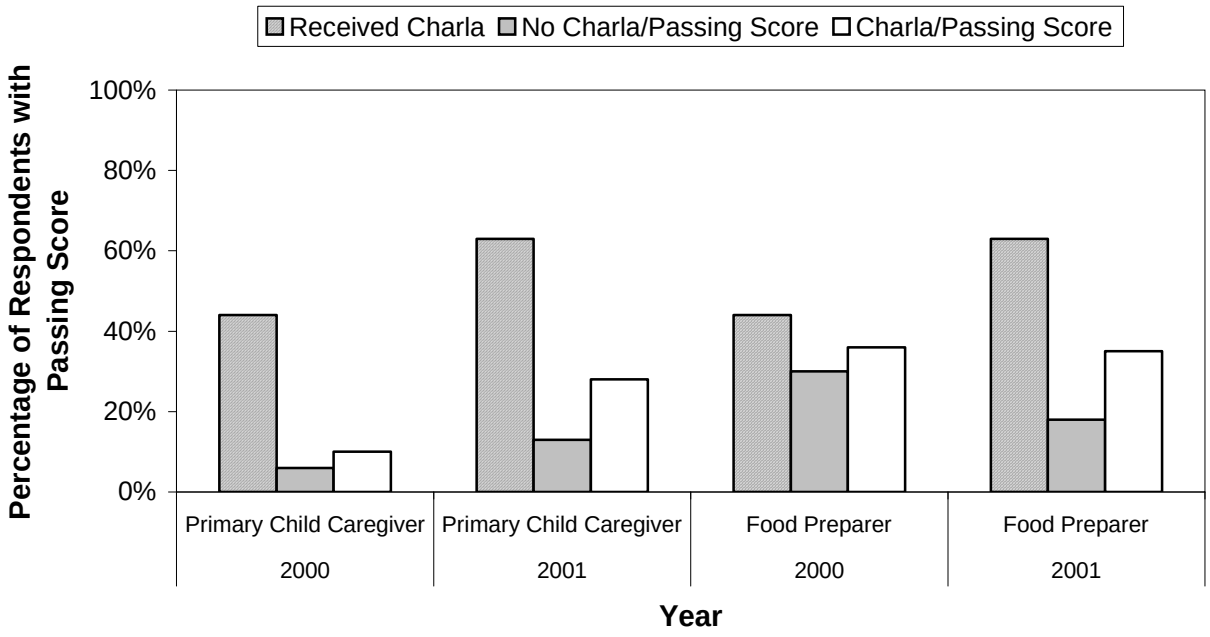

Figure 3.2.1.2 Comparison of Health Education and Hand Washing Scores
Nicaragua – Study Area 1 – Nueva Segovia, February 2001

Percentage of population using hygienic sanitation facilities

Proper disposal of excreta is essential to protect the health of the community members, particularly children. This indicator focuses on the percentage of the population that used hygienic sanitation facilities, where a sanitation facility is defined as a functioning toilet or latrine where excreta are disposed. This indicator was met if the facility was hygienic and used by household members greater than 12 months of age.

A facility was considered hygienic if there were less than three flies present and no excreta were found outside the latrine. It was considered in use if the latrine had one or more of the following conditions: it had been recently cleaned with water, there was a path to the latrine, there were signs of recently being swept, there were signs of recent repair, and there were no spider webs.

Use of Hygienic Facilities

Table 3.2.1.8 is a summary of the characteristics of the sanitation facilities. The percentage of latrines that were hygienic and in use increased from 81% during the baseline survey to 87% during the mid-term survey. During this time period, there was also a slight increase in the percentage of the population older than 12 months of age using a hygienic latrine, from 68% to 73%. The mean distance from a sanitation facility to a hand washing area decreased from 18 m during the baseline survey to 15 m during the mid-term survey.

Table 3.2.1.8 Sanitation Facility-Use and Practice
Nicaragua – Study Area 1 – Nueva Segovia, February 2001

Sanitation Facilities	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**

Total population >12 months of age using a latrine	92% (439/477)	**87% (468/537)**
Latrines that are hygienic and in use *	81% (75/93)	**87% (89/102)**
Population > 12 months of age using a hygienic latrine	68% (324/477)	**73% (390/537)**
Dispose of baby's** waste in a latrine	67% (41/61)	**66% (27/41)**
Dispose of baby's waste not in a latrine	18% (11/61)	**34% (14/41)**
Mean distance to hand washing area	18 m	**15 m**

* Hygienic is <3 flies present and no excreta are found outside the latrine. In Use if household members are reported to use the latrine and the latrine has one or more of the following, recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
** baby defined as a child less than 12 months of age
>greater than

Care and Use of Latrine Education

The American Red Cross, Nicaraguan Red Cross, and Dutch Red Cross conducted a majority of the health education workshops focusing on the care and use of latrines that were reported by the study participants during the mid-term survey. The mid-term survey showed that 54% (56/104) of households had received a charla on the care and use of latrines, and increase from the baseline survey that showed that 48% (46/95) of households had received a charla on the care and use of latrines, and the majority of these charlas were provided by the Ministry of Health (Figure 3.2.1.3).

Of the households that had access to sanitary facilities, the people that had received a charla on the care and use of latrines had approximately the same percentage of sanitary latrines as those that didn't receive a charla: 87% (48/55) as compared to 89% (42/47). Similar results were seen during the baseline survey (Figure 3.2.1.3).

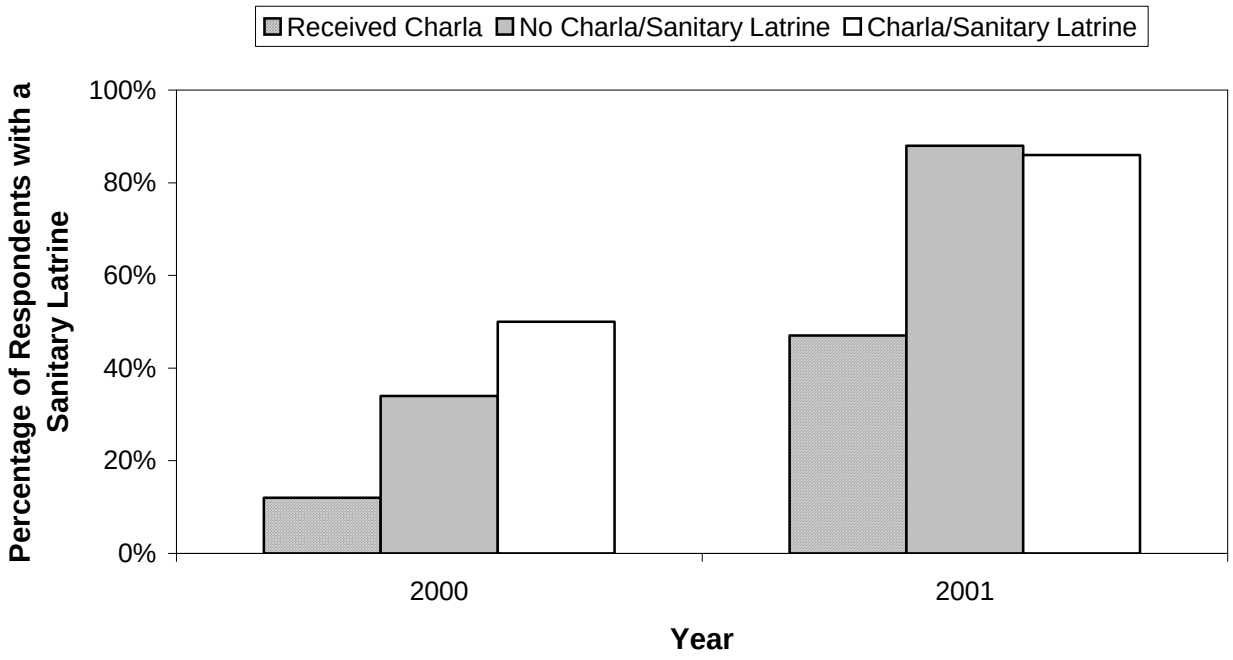

Figure 3.2.1.3 Comparison of Health Education and Sanitary Latrines
Nicaragua – Study Area 1 – Nueva Segovia, February 2001

Monitoring Indicators

Percentage of households with year-round access to water

This indicator is a measure of the homes that are directly connected to a piped system or that have an adequate public, private or shared water source that is located within 200 meters of the home, and is used for drinking, cooking, cleaning, and bathing. No particular level of water quality is implied. Water sources defined as "adequate" may include protected wells and springs, but do not include untreated surface waters.

Sixty five percent (67/104) of the households in the mid-term survey had year-round access to an improved water source, an increase from the baseline survey, in which 43% (43/100) had year-round access to an improved water source. The percentage of households reported by the interviewers to be located within 200 meters of their primary water source increased from 91% (62/68) in the baseline survey to 96% (99/103) in the mid-term survey. The mid-term survey showed an overall decrease in the average distance to an improved water source compared to the baseline survey, 23 m vs. 76 m, and the percentage of households with a protected water source increased from 81% (82/101) during the baseline survey to 96% (100/104) during the mid-term survey. However, the percentage of households that reported that they had access to water all year round decreased from 83% (83/100) in the baseline survey to 70% (72/103) in the mid-term survey.

Prior to Hurricane Mitch, households reported traveling an average of 968 m to get water (median 21 m) with a range of 0 m to 20,000 m. After Hurricane Mitch, at the time of the

baseline survey, the distance to the water source decreased, with a range from 1-2000 m, a mean of 84 m and a median of 11 m. The distance participants reported traveling to get to their primary water source decreased further during the mid-term survey, ranging from 0 m to 3000 m, with a mean distance of 65 m and a median distance of 4 m.

During the mid-term survey, interviewer estimates of the distance from the interviewed household to its primary water source were slightly less than the estimates of the interviewees (i.e., mean distance of 63 m and a median distance of 5 m for the interviewer estimates). There was a more complete dataset for this variable for the participants' responses than the interviewers: 99% (103/104) of the surveys had a participant-reported distance while only 87% (90/104) had and interviewer-reported distance. For this reason, the participants' response was used as the measurement of distance to the household's primary water source.

As shown in Table 3.2.1.9, no association was seen between the distance to the water source and the volume of water collected during either the baseline survey or the mid-term survey. The average volume of water collected from water sources 10 m or less from a household was 139 L per day. The average volume collected increased to 159 L per day from water sources located 11-50 m from a household, and decreased to 119 L per day in water sources 51-100 meters from a household.

Table 3.2.1.9 Daily Volume of Water Collected in Relation to Distance from Household to Water Source
Nicaragua - Study Area 1 - Nueva Segovia, February 2001

Distance (meters)	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=74	**2001 N=104**	2000	**2001**	2000	**2001**	2000	**2001**
≤10	35	**86**	0-810	**4-999**	138	**139**	65	**57**
11-50	24	**11**	0-440	**19-437**	94	**159**	60	**114**
51-100	4	**3**	12-440	**29-218**	188	**119**	100	**110**
101-200	4	-	48-370	-	182	-	156	-
201-500	5	-	40-660	-	252	-	60	-
501-998	-	**1**	-	-	-	**12**		**12**
≥999	2	**3**	10-80	**38-228**	100	**152**	45	**190**

≤ less than or equal to
≥ greater than or equal to

Percentage of households with access to a sanitation facility

Households were considered to have access to a sanitation facility if that household had a private facility or shared a facility with others in the community. During the mid-term survey, 99% (101/102) of households reported having access to a sanitation facility. This is an increase from the baseline survey in which 96% (95/99) reported having access to sanitation (Table 3.2.1.10). The percentage of households with private sanitation facilities increased from 85% (85/99) in the baseline survey to 98% (100/102) in the mid-term survey. Almost all of the latrines in the community are dry pit latrines: in the baseline survey, 98% (94/96) were dry pit latrines, and increased to 159 L per day 99% (100/101) were dry pit latrines during the mid-term survey (Table 3.2.1.10).

Table 3.2.1.10 Household Access and Description of Sanitation Facilities
Nicaragua – Study Area 1 – Nueva Segovia, February 2001

Sanitation Facility	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Access to a latrine	96% (95/99)	**99% (101/102)**
Number of latrines inspected	100% (95/95)	**100% (101/101)**
Private facility	85% (85/99)	**98% (100/102)**
Shared facility	11% (10/99)	**1% (1/102)**
Dry pit latrines	98% (94/96)	**99% (100/101)**
Composting latrine	--	**1% (1/101)**
Pour flush latrines	2% (2/96)	--

Percentage of recurrent costs for water supply services provided by the community served

The mayor's office is coordinating the costs of the water supply services in Dipilto Nuevo and Dipilto Viejo. The community's contribution is not sufficient.

Percentage of constructed water supply systems operated and maintained by the communities served

The mayor's office is coordinating the operation and maintenance of the water supply systems in Dipilto Nuevo and Dipilto Viejo. The community's development board has been involved in the process. However, this indicator cannot be assessed until the water supply systems are completed in all study areas.

Water Quality Testing

The results of the analyses of the community water source and household water samples are summarized in Table 3.2.1.11. All water samples were analyzed using the portable DelAgua Water Testing Kit and total coliforms and *E. coli* were quantified and reported as CFU/100 ml of water. A subset of samples was analyzed in duplicate using the DelAgua kit, and a subset of samples was analyzed by a qualitative test using the PurTest kit to confirm the presence or absence of total coliforms and *E. coli*. A sterile water blank was analyzed with each batch of samples to verify that sterile conditions were being maintained.

Table 3.2.1.11 Community and Household Water Sources Receiving Treatment and Coliform Results
Nicaragua - Study Area 1 - Nueva Segovia, February 2001

Water Tested		Sample Size (N)		Water Treated		Percent of Samples Positive for Total coliforms		Percent of Samples Positive for *E. coli*	
Year		2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
Community source	All	9	**4**	0%	**25%**	67% (6/9)	**100% (4/4)**	67% (6/9)	**75% (3/4)**
	Dipilto Nuevo	5	**1**	0%	**0%**	80% (4/5)	**100% (1/1)**	80% (4/5)	**100% (1/1)**
	Dipilto Viejo	4	**3**	0%	**33% (1/3)**	50% (2/4)	**100% (3/3)**	50% (2/4)	**67% (2/3)**
Household samples	All	19	**11**	0%	**36% (4/11)**	79% (15/19)	**100% (11/11)**	79% (15/19)	**100% (11/11)**
	Dipilto Nuevo	12	**6**	0%	**33% (2/6)**	67% (8/12)	**100% (6/6)**	67% (8/12)	**100% (6/6)**
	Dipilto Viejo	7	**5**	0%	**40% (2/5)**	86% (6/7)	**100% (5/5)**	86% (6/7)	**100% (5/5)**

Community Water Source

Dipilto Viejo and Dipilto Nuevo have separate water systems, each supplied by a different springs. Water is fed into water storage tanks and then is distributed to the households by gravity through pipes. At the time of the mid-term survey, the water in both of the distribution tanks was contaminated. In Dipilto Nuevo (San Agustin), total coliform bacteria in the 100 ml water sample taken from the tank were too numerous to count (TNTC). This sample also contained 2 CFU *E.coli*/100 ml water. The water sample taken from the tank in Dipilto Viejo contained 255 CFU total coliform bacteria/100 ml, but was free of *E. coli*.

Household Water Samples

During the mid-term survey, water samples were taken from water stored in 11 households for drinking. As shown in Table 3.2.1.11, 100% of the samples were contaminated with total coliforms. Quantitative results ranged from 255 CFU/100 ml to (TNTC) for total coliform and 1 CFU /100 ml to TNTC for *E. coli*.

Although the mid-term results could not be quantitatively compared to the baseline survey because of the lack of reliability in the laboratory results from the baseline survey, the results could be compared qualitatively, that is, as the presence or absence of total coliform and *E. coli*. The number of both community and household water samples testing positive for total coliforms and *E. coli* increased between the baseline survey and the mid-term survey. The percentage of community water samples testing positive for total coliforms and *E. coli* during the mid-term survey increased to 100% from 67% of samples testing positive for total coliforms during the baseline survey, and to 75% samples from 67% positive for *E. coli.* Likewise, in the baseline survey, 79% of the household water samples tested positive for total coliforms and *E. coli*, whereas in the mid-term survey, 100% tested positive for total coliforms and *E. coli.*

Thirty-six percent (4/11) of households where water was sampled reported treating their water on the day of the interview. All of the household water samples that were tested were contaminated with total coliforms and with *E. coli*, regardless of whether it had been treated on the day of the survey.

Quality Assurance

One water sample was analyzed in duplicate using the DelAgua kit, and identical results were obtained for the duplicate samples. No bacteria grew in the two sterile water blanks analyzed, one using the DelAgua kit and the other using the PurTest kit, indicating that sterile conditions were adequately maintained during processing of the water samples.

The results of the qualitative analyses run using the PurTest kit confirmed the results of the analysis using the DelAgua kit. One community water source tested positive for total coliforms and *E. coli* using both the PurTest kit and the DelAgua test kit, and the four household water samples that were analyzed using the PurTest kit were found positive for total coliforms and *E. coli,* confirming the results using the DelAgua test kit.

Storage, Handling and Treatment

A summary of the way water is stored, handled and treated in the homes in Nueva Segovia is shown in Table 3.2.1.12. Water in the home was stored, handled and treated similarly in the mid-term and the baseline survey. The same percentage of households (94%) had water stored in their homes in the baseline and in the mid-term survey. Slightly more people covered their drinking water and fewer people dipped a cup into the stored water to get a glass of water during the mid-term survey compared to the baseline survey. However, there was a large decrease in the treatment of water between the two years, with fewer people reporting that they treated their water on the day of the survey and fewer people reporting that they always treated their water. Nevertheless, of those who reported that they did treat their water, a greater percentage said they used chlorine in the mid-term survey when compared to the baseline survey.

Table 3.2.1.12 Summary of Water Storage, Handling and Treatment
Nicaragua – Study Area 1 – Nueva Segovia, February 2001

Technique	Baseline Survey 2000	**Mid-term Survey 2001**
Storage and Handling		
Store water at home	94% (95/101)	**94% (96/104)**
Stored drinking water	93% (93/100)	**95% (99/104)**
Covered drinking water	82% (80/98)	**86% (85/99)**
Dip in a cup for water	72% (68/95)	**70% (70/100)**
Pour water into a cup/glass	23% (22/95)	**18% (18/100)**
Treatment		
Treated water day of survey	36% (35/98)	**20% (21/103)**
Always treated their water	29% (27/93)	**18% (18/102)**
Sometimes treated their water	36% (33/93)	**41% (42/102)**
Never treated their water	36% (33/93)	**41% (42/102)**
Treat water with chlorine	58% (53/92)	**83% (50/60)**
Treat water by boiling	9% (8/92)	**10% (6/60)**

Other methods of treatment	2% (2/92)	**7% (4/60)**

Water Treatment Education

The ARC conducted a majority of the charlas focusing on proper storage and treatment of water reported by the study participants in the mid-term survey, whereas the Ministry of Health conducted a majority of the health education charlas during the baseline survey. The survey showed that 62% (64/104) of households reported receiving a charla on how to treat household water, compared to 51% (51/100) of the households during the baseline survey.

Figure 3.2.1.4 summarizes the observed activities for those who did and did not receive charlas on the storage and handling of household water. Only slight differences were seen in the prevalence of observed water-related activities between study participants who did and did not receive a charla on proper storage, handling and treatment of household water. Nearly all households stored water and stored drinking water, regardless of whether they had received a charla on proper handling and treatment of water. The percentage of households that had covered drinking water and dipped a cup into the stored water to serve it was also very similar for those who had and had not received a charla, and a slightly lower percentage of households that had received a charla poured the water from the stored water container than those who had not received a charla.

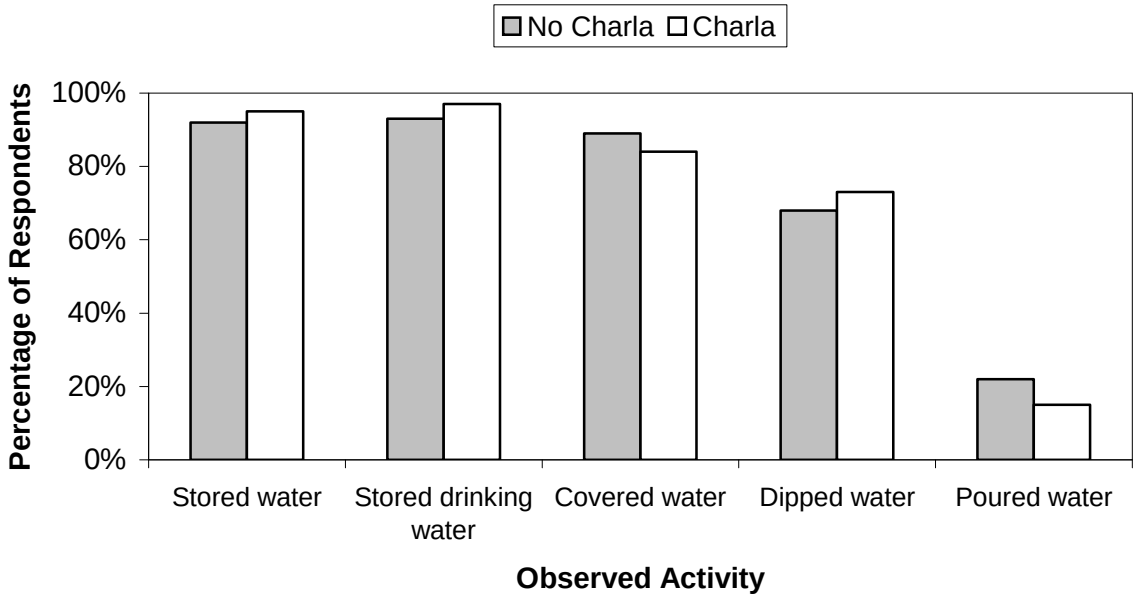

Figure 3.2.1.4 Water Storage Activities Observed by Interviewer in Relation to Receiving a Charla on Proper Storage and Handling of Water
Nicaragua – Study Area 1 – Nueva Segovia, February 2001

Figure 3.2.1.5 summarizes the reported activities for those who did and did not receive a charla on water treatment. Slightly more of the households that had received a charla reported treating the water on the day of the survey and treating their water at least sometimes than those who had not received a charla. However, a higher percentage of households that did not receive a charla

reported using chlorine, and more households who had received a charla reported boiling their water.

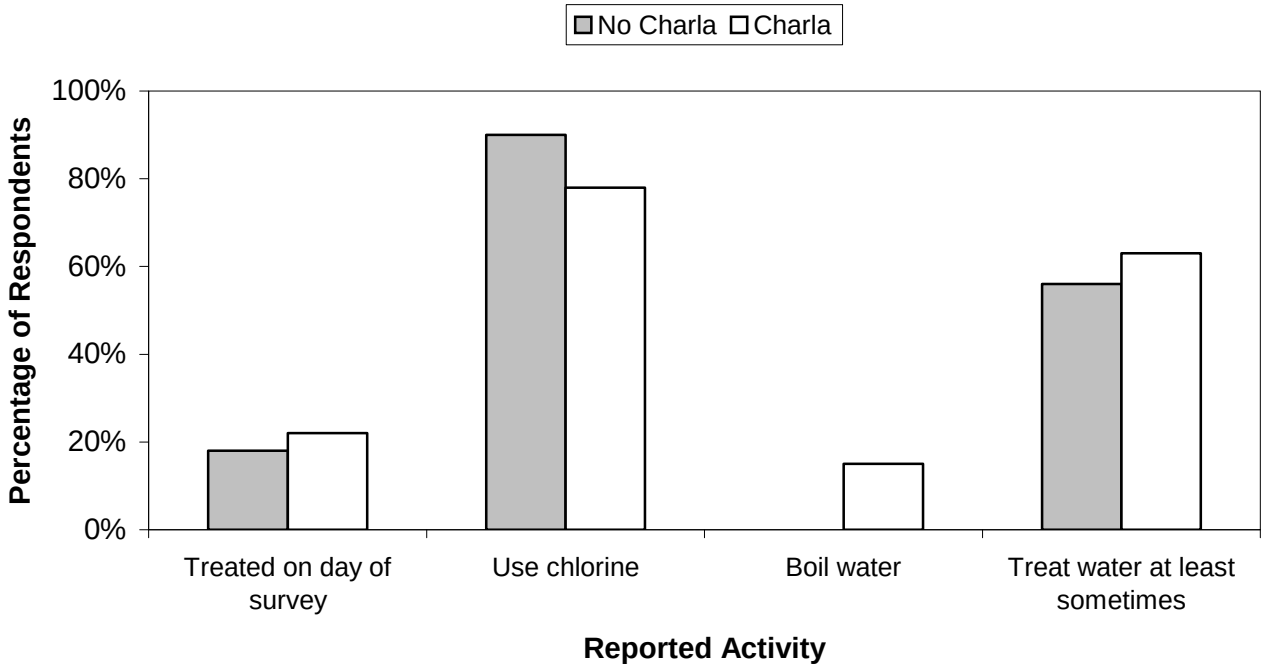

Figure 3.2.1.5 Water Treatment Activities Reported by Study Participants in Relation to Receiving a Charla on Proper Treatment of Water
Nicaragua – Study Area 1 – Nueva Segovia, February 2001

There was little association between treatment of water reported by respondent and contamination of water. Of the four community samples tested, 25% (1/4) were not contaminated with *E. coli*. This water sample was taken from a covered distribution tank reported to be treated regularly. Of the 11 household water samples tested, 36% (4/11) were reported treated, and all of these samples were contaminated with total coliforms and *E. coli*.

Discussion

The baseline and mid-term survey USAID Impact Indicators in Nueva Segovia are summarized in Table 3.1.1.13. The water and sanitation interventions in Nueva Segovia were completed at the time of the mid-term survey, but the health education campaign had just begun in January 2001. Other agencies had been conducting health education classes in one of the communities the past year. Comparison of the data collected during the baseline and the mid-term surveys shows that the interventions are improving the health of the community and their access to and use of water and sanitation facilities. It should be recognized that the interventions are in progress and the final survey in February 2002 will clearly define the impact of the interventions on this community. Nevertheless, at the time of the mid-term survey, goals were already met for two of the seven indicators, and progress was made toward reaching the final goals set for three other indicators.

Table 3.2.1.13 Performance Indicators
Nicaragua - Study Area 1 – Nueva Segovia, February 2001

Performance Indicator	USAID Guideline	Status During Baseline Survey (2000)	Final Goal (2002)	Status During Mid-term Survey (2001)	Percent Difference : Baseline to Mid-term[1]	Progress To Goal: Baseline to Mid-term[2]	Status Relative to Final Goal[3]
Impact Indicator							
Children under <36 months with diarrhea in the last 2 weeks[4]	25% decrease	29 (17/59)	≤22	13 (8/63)	55% decrease	NA	>100%
Quantity of water used per capita per day	100% using 50 Lpd	16% (15/96)	100%	21% (22/104)	NA	5% increase	21%
Child caregiver with appropriate hand washing behavior	50% increase	33% (33/100)	≥50%	30% (23/78)	9% decrease	NA	0%
Food preparers with appropriate hand washing behavior	50% increase	33% (32/97)	≥50%	29% (30/103)	12% decrease	NA	0%
Population using hygienic sanitation facilities[5]	75% usage	68% (324/477)	≥75%	73% (390/537)	NA	5% increase	97%
Monitoring Indicator							
Households with year-round access to water[6, 7]	NE	43% (43/100)	100%[7]	65% (67/104)	NA	22% increase	65%
Households with access to a sanitation facility[7]	NE	96% (95/99)	100%[7]	99% (101/102)	NA	3% increase	99%

1 Calculated ONLY for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values
2 Calculated ONLY for indicators with goals with an absolute goal (e.g., 100%) by subtracting the baseline value from the mid-term value
3 Status with respect to the final goal for each indicator, calculated for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values divided by the goal, calculated for those with an absolute goal (e.g., 100%) by dividing the mid-term value by the goal; >100% indicates that the goal was exceeded
4 Goal is a reduction in the number of cases of diarrhea per 100 children in the study population.
5 A facility is considered hygienic if there are less than 3 flies present and no excreta are found outside the latrine. A latrine is IN USE if latrine it has one or more of the following conditions: recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
6 Water source is less than 200 meters away from the household and there is access to water year-round.

7 Goal was established by the American Red Cross
NE none established

Impact Indicators

The overall period prevalence in all children younger than 36 months of age with diarrhea in the two weeks prior to the survey decreased from 29 cases of diarrhea per 100 children during the baseline survey to 13 cases per 100 children during the mid-term survey and met the proposed final goal for this indicator of a 25% decrease in period prevalence of diarrhea. There was an increase in the percentage of children who were breastfeeding, but the period prevalence of diarrhea in children breastfeeding was the same as the period prevalence of diarrhea in children not breastfeeding. This is unusual because breastfeeding is usually considered protective of children and would decrease their prevalence of diarrhea. In the baseline survey, the period prevalence of diarrhea was higher in children that were not breastfeeding than in those breastfeeding.

Unlike the results of the household survey, the active diarrhea surveillance demonstrated a similar distribution of cases between the baseline and the mid-term survey, with the youngest age group (less than 36 months) having the highest rates and the oldest age group (greater than or equal to 65 years) having the lowest rates.

The USAID guideline recommends that 100% of households obtain 50 L/person/day of water for household use. The percentage of households that obtained 50 L/person/day or greater increased from 16% to 21% from the baseline to the mid-term survey, which corresponds to and increase in the use of private spigots from 45% to 78% during this time period. Household spigots provided the greatest volume of water of all water sources used in Nueva Segovia. Use of water in the home also increased, with people reporting washing clothes more frequently, washing clothes at home instead of at a neighbor's house or in the river, and more people reporting that they bathed daily. However, there was no apparent association between the distance from the primary water source to the household and the daily volume of water collected, which may indicate that the respondents were not yet relying fully on the installed water intervention. Additionally, more people had to wait for longer than one hour to get water during the mid-term survey than the baseline survey, which may indicate problems with water distribution in these communities.

The average daily water metered volume in households with private spigots was 677 L per household, compared to the average self-reported volume of 145 L/day per household, indicating that households with household spigots may have under-reported their daily use. The volume of water measured leaving the tank is divided by the total number of houses receiving piped water results in an average of 50 L/household/day. This indicates that the water meter on the tank may not have been functioning properly, or that the households not metered used very little water.

Appropriate hand washing behavior is critical in breaking the fecal-oral route of disease transmission. The results for this indicator showed that the percentage of both child caregivers and food preparers that received passing hand washing scores during the mid-term survey decreased slightly in comparison to the baseline survey. This was unexpected because health education classes by the Red Cross focusing on appropriate hand washing behavior had been initiated in the community just before the mid-term survey. Nevertheless, a higher percentage of those who reported receiving a charla on proper hand washing techniques had passing hand washing scores than those who had not received a charla.

The percentage of the population using hygienic facilities increased from 68% to 73%, falling just short of the goal for the final survey that 75% of the population use hygienic facilities. Most of the population had access to a latrine at the time of the baseline survey, so the percentage of households with access to a latrine increased only slightly from 96% during the baseline survey to 99% during the mid-term survey. However, less of the population reported that they used a latrine. During the baseline survey, much of the population was living in temporary or shared housing, but by the time of the mid-term survey the new houses were constructed and most people had moved in to them. Some of the households constructed in the housing program did not provide latrines, and these households had to construct their own latrines. Nevertheless, there was an increase in the percentage of hygienic latrines from 81% to 87% from the time of the baseline to the time of the mid-term survey.

Monitoring Indicators

An improved water source is one that can provide a sufficient amount of water to meet the needs of each person in a community, is located within 200 m of the household, and comes from a protected well or spring, or a treated surface water. Although the ARC goal of 100% access to an improved water source was not reached by the time of the midterm survey, significant progress was made toward this goal. The percentage of households with year-round access to improved water increased from 43% during the baseline survey to 65% during the mid-term survey.

The ARC final goal of 100% access to a sanitation facility was nearly met at the time of the mid-term survey, with 99% of the surveyed households reporting that they had access to a latrine. This progress toward the final goal is remarkable because there was not a latrine construction program in half of the community in Nueva Segovia.

Water Quality Testing

Quantitative analyses of the community water source and a subset of stored household water sources for total coliforms and *E. coli* showed that both community and household water sources were contaminated with total coliforms and *E. coli* at the time of the mid-term survey. The results from the baseline survey were compared to the mid-term survey in a qualitative manner because the results obtained during the baseline survey from an off-site laboratory were provided for fecal coliform. This comparison indicates that more of the community and household waster sources were contaminated during the mid-term survey than during the baseline survey. The results obtained using the DelAgua kit during the mid-term survey may be more sensitive than those from the baseline survey, and they are more reliable because there is no doubt about what analytic processes were used.

One of the community systems reported regularly treating the water in the distribution tank and this water sample had no detectable *E.coli*. However, the distribution tank from the other system, which was contaminated with total coliforms and *E. coli* during the mid-term survey, is not well maintained. It has no cover, and is thus open to contamination by a variety of sources, including livestock or wild animals.

There was likewise no association with the household treatment of water and water contamination. All of the water samples taken at households that reported treating their water on the day of the survey were contaminated with total coliforms and *E. coli*. Health education classes on the care and treatment of household water were associated with slightly better practices in the care, storage and treatment of water.

Recommendations

The CDC recommends that the ARC continue its involvement in Dipilto Nuevo and Dipilto Viejo to ensure the successful completion of the latrine and health education project. The mid-term survey revealed progress towards the final goal on most of the impact and monitoring indicators.

Water

CDC recommends the ARC verify that the water project for the two re-settlement communities is completed at the time of the final survey. Access to water for the households in these two communities should be increased. Since the water interventions were apparently complete at the time of the mid-term survey, it is important for the ARC to verify that all of the participants in the intervention have received access to the water system, as planned, and to identify any people in the two communities who do not have access to the distributed water. The ARC should review the operation of the water systems to determine if there are measures that can be undertaken to reduce the amount of time recipients have to wait for water, and to increase the year-round access to water in these communities.

Sanitation

CDC recommends the ARC identify the households in Nueva Segovia that were not included in the initial sanitation intervention, and determine whether they have adequate access to sanitation facilities. The ARC should communicate with the agencies that are providing new houses in Dipilto Viejo, to coordinate provision of sanitary facilities to new households. CDC recommends the ARC continue health education classes focusing on care and use of latrines to reinforce messages about how to maintain latrines in a hygienic condition.

Hand Washing Behavior

CDC recommends the ARC provide more targeted health education classes on appropriate hand washing behaviors with an objective of increasing the knowledge and practice of appropriate hand washing behaviors among all members of the community, and particularly caregivers, food preparers, and children.

Water Quality Testing

CDC recommends the ARC verify the microbial quality of the water sources in Dipilto Nuevo and Dipilto Viejo, that they investigate whether a systematic water testing program has been established, and review the water treatment program for the community water sources. CDC also recommends that ARC ascertain whether the water committee received the proper training to maintain all aspects of the water project once the water project was completed.

Study Area 2 – Waspam

Waspam is a rural community made up of smaller communities located in the Gracias a Dios Region of Nicaragua along the Rio Coco (Coco River). There are two areas used to make up one study are which are Andres and Kum. The baseline survey was completed in Waspam on February 8th and 9th, 2000. There were 549 households in these communities with a population of 3,812 people. Of these households, 112 surveys were completed.

For the mid-term survey there were 501 households in these communities with a population of 4,344 people. A team of 10 interviewers, the ARC in-country wat-san and health delegates, and one CDC investigator conducted interviews from a subset of this community, 103 households, on February 11-12, 2001. Travel to these communities was via land to Kum and then by river to Andres. The goal was to collect data from 100 households. Both communities were very motivated to take part in the study as demonstrated by the 100% (103/103) participation rate. Water samples from the eight community water sources and 12 randomly selected households where interviews were being conducted were collected and analyzed for indicators of fecal contamination. In addition, a community survey was completed in Andres and Kum with the community leaders who were knowledgeable of the water and sanitation conditions in each community. Community descriptions are provided for both Andres and Kum, but the baseline and mid-term survey data for both of the communities was combined for analysis and comparison of the results of the two surveys. Twenty-seven percent (28/103) of the households who participated in the mid-term survey had participated in the baseline survey of 2000.

Community Description

Andres

The community council (director of the grade school, the city council chief, the community coordinator, the judge, the heads of the churches of the community, the head of the women's group, the head of the seniors group, several policemen, and an interested party), the regional ARC health delegate, and one CDC investigator completed the community survey in Andres on February 12th, 2001. At the time of the mid-term survey, the council felt that the community's greatest need was food as well as latrines, preferably one per each home.

The community of Andres has been in existence for more than 100 years. The community, which is divided into barrios (neighborhoods), had 186 houses with a population of 1,996 people at the time of the mid-term survey. During the baseline survey, Andres had 187 houses with a population of 1,098 people.

The people of this community are all Miskito Indians and speak Miskito. A council of community members governs them. The primary form of employment is agriculture. The education level of the population is about the fourth grade. Annually, the community has 2 to 3 feet of flooding and homes are built on stilts. Andres experienced severe flooding after Hurricane Mitch.

The community was receiving food aid from ARC following Hurricane Mitch that stopped in October 1999. The residents have health care that is provided by the Ministry of Health. There

is a health post that provides care to the community with a doctor who rotates through the clinic every one to two years. The community had some health education in October 1999 that focused on the proper use of latrines.

The community water supply is primarily the Rio Coco and is augmented by rainwater collected from rooftops and community wells. There are three community wells. One well is located near a home and is being used. The second well is near the school and health post and is dry. The third well was dug recently and was tested by Accion Medica, a local non-government organization (NGO). This well was determined to be 'toxic' and the community has never used it. Wells are difficult to dig in this area because the soil is sandy and collapses. The Ministry of Health had provided simple sand filters to the community; however, the filters were used incorrectly and eventually not used.

The community has no formal sanitation system. The health post and a few private homes have sanitation. In 1993, Accion Medica constructed 40 latrines in the community, all of which have been destroyed by flooding. Accion Medica again constructed latrines but the community was not provided information on how to maintain them.

Kum

The community council (the judge, the head of agriculture, some of the members of the water board, the heads of the churches of the community, the head of the women's group, and the head of the seniors group), and the regional ARC health delegate completed the community survey. At the time of the mid-term survey, the council felt that their community's greatest need was to obtain medicine and supplies for the health post. The women's group expressed the need for food aid.

Kum is a geographically larger community than Andres and has been in its present location for 500 years. The community consisted of 315 houses with a total of 2,348 people at the time of the mid-term survey. At the time of the baseline survey, the community had 362 houses with a population of 1,904 people.

The people of this community are all Miskito Indians and speak Miskito. Like Andres, a council governs Kum. The primary form of employment is agriculture. Kum experiences flooding every couple of years, and like Andres, the homes in Kum are built on stilts. Kum also had flooding from the Rio Coco after Hurricane Mitch.

The community was receiving food aid from ARC following Hurricane Mitch that stopped in October 1999. The residents have health care that is provided by the Ministry of Health. There is a health post that provides care to the community with a doctor who rotates through the clinic every one to two years. The health clinic has limited medical supplies (medicine) but now has electricity. The water board provided some health education in October 1999 that was focused on water, wells, and latrines.

At the time of the baseline survey the primary water supply for the community was Kum Creek and rainwater collected from rooftops. At the time of the mid-term survey, Kum Creek was still the primary water source but wells were also being used. The ARC constructed three wells in

this community that are all currently in use. There is a fourth well located at the health post that people report is contaminated. The community has problems with sandy soil that collapses when the residents have tried to dig wells. A six-person water board helped arrange the digging of the first two ARC wells. There is no formal payment system for use of the wells, but members of the water board would go house to house to collect funds if a problem with the wells arose. Additional wells are planned and others are currently being constructed. The community has no formal sanitation system. The baseline survey identified twelve houses with private pit latrines.

Demographic Information

The mean household size during the mid-term survey was 7.5 people per household, which was less than the household size in the baseline survey (8.4 people per household). On average, 0.7 children less than 36 months of age lived in each house, which is less than the baseline survey (1.2 children).

In the mid-term survey, 92% (95/103) of respondents reported living in their own home and 8% (8/103) lived with friends or family. These percentages were about the same as those reported in the baseline survey, in which 88% (99/112) reported living in their own home, 10% (11/112) lived with friends or family and 2% (2/112) were in temporary shelters.

Education

The mean education level reported in the mid-term survey was four years compared to 3.5 years reported in the baseline survey. The interviewees had 0 to 11 years of formal education. During the mid-term survey 39% (40/103) of interviewees had no formal education and 8% (8/103) of interviewees had completed 6 years of education. The education level of the respondents of the mid-term survey was similar to those surveyed during the baseline survey. During the baseline survey 27% (30/112) had no formal education and 18% (20/112) had completed 6 years of education.

Status of Intervention

The interventions were community-specific and based on existing resources and needs. Table 3.2.2.1 summarizes the perceived community need before the intervention (i.e., February 2000) and the intervention planned by the ARC. Additionally, this table lists the status of each intervention at the time of the mid-term survey.

Table 3.2.2.1 Community Needs, Planned Interventions and Status of Interventions
Nicaragua- Study Area 2- Waspam, February 2001

Country/ Study Area	Perceived Community Need	Planned Intervention	Status of Intervention as of February 2001
Nicaragua-Waspam	Andres: latrines	• Install 3 new wells ♦Household latrines + Education program-hygiene, water use, and sanitation	• Wells not constructed ♦Household latrines under construction + Hygiene and sanitation education programs completed and ongoing by other NGOs
	Kum: better health center	• Install new wells ♦Build shared latrines (at school) + Education program-latrine care and use	• Installed 3 wells, 4 more planned ♦Built 2 shared latrines; household latrines under construction + Hygiene and sanitation education programs completed and ongoing by ARC

Performance Indicator

Impact Indicator

Percentage of children under <36 months with diarrhea in the last two weeks

Table 3.2.2.2 summarizes the reported diarrhea prevalence and breast-feeding practice among children less than 36 months of age in the two weeks prior to the baseline and mid-term surveys.

Table 3.2.2.2 Diarrhea Prevalence and Breast-feeding Practice in Children
Nicaragua - Study Area 2 - Waspam, February 2001

Age	Period Prevalence of Diarrhea* (per 100 children)		Percent of Children Breast-fed		Period Prevalence of Diarrhea Breast-feeding (per 100 children)		Period Prevalence of Diarrhea Not Breast-feeding (per 100 children)	
Year	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
6 months	60 (21/35)	**6 (1/17)**	69% (24/35)	**82% (14/17)**	58 (14/24)	**7 (1/14)**	64 (7/11)	**0 (0/3)**
7-12 months	56 (9/16)	**47 (9/19)**	94% (15/16)	**84% (16/19)**	60 (9/15)	**50 (8/16)**	0 (0/1)	**33 (1/3)**
13-24 months	38 (15/39)	**32 (8/25)**	38% (15/39)	**32% (8/25)**	53 (8/15)	**38 (3/8)**	29 (7/24)	**29 (5/17)**
25-35 months	42 (5/12)	**38 (6/16)**	17% (2/12)	**0% (0/16)**	50 (1/2)	**0 (0/0)**	40 (4/10)	**31 (6/16)**
< 36 months	49 (50/102)	**31 (24/77)**	55% (56/102)	**50% (38/77)**	57 (32/56)	**32 (12/38)**	43 (20/46)	**28 (12/39)**

* Illness occurred within 2 weeks prior to the survey
< less than
≤ less than or equal to

The overall period prevalence of diarrhea in children less than 36 months of age was 31 cases per 100 children in the mid-term survey. Half of the women who were surveyed breast fed their children, 50% (38/77). There were 32 cases of diarrhea per 100 children who were breast-fed and 28 cases of children per 100 children with diarrhea who were not breast-fed.

The period prevalence of diarrhea decreased during the mid-term survey to 31 per 100 children, from 49 per 100 children during the baseline survey. The period prevalence decreased in all age groups. The percent of women who breast-fed was about the same in both surveys. The prevalence of diarrhea in both the breast-fed and non breast-fed children decreased overall in both groups in the mid-term survey compared to the baseline survey. The results showed a decrease in the period prevalence for diarrhea in children in all age groups for children who were breast-fed, and for all children who were not breast-fed, except for children in the 7 to 12 month age group, in which the period prevalence increased.

Active Diarrhea Surveillance

Active diarrhea surveillance was conducted with all household members in the household survey and the results are summarized in Table 3.2.2.2a. The mean age in the mid-term survey was 21 years with a range of less than one year to 98 years old. Compared to the baseline survey the mean age and range was about the same, 20 years, and less than one year to 86 years, respectively. The average weekly diarrhea prevalence for all age groups was 4.3 per 100 people,

which is less than the average weekly diarrhea prevalence during the baseline survey of 6.6 cases per 100 people. The male to female ratio was approximately 1:1, and was the same as in the baseline survey. The weekly prevalence of diarrhea for each age group by week was lower or remained the same in the mid-term survey when compared to the baseline survey. The highest weekly average was in children less than 36 months and the lowest weekly average was in adults 65 years or older. Only one case of diarrhea was reported in the greater than or equal to 65 year old age group.

Table 3.2.2.2a Diarrhea Prevalence by Age and Week
Nicaragua - Study Area 2 - Waspam, February 2001

Age	Diarrhea Prevalence by Week (per 100 people)									
	Weekly Avg.		Week 1		Week 2		Week 3		Week 4	
	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
All ages	6.6	**4.3**	8.6 (81/943)	**5.7 (44/778)**	5.1 (47/925)	**3.1 (24/770)**	6.4 (60/942)	**4.0 (31/769)**	6.3 (59/941)	**4.2 (32/766)**
<36 months	29.4	**17.6**	40.5 (32/79)	**16.9 (10/59)**	21.5 (17/79)	**12.7 (7/55)**	27.8 (22/79)	**14.5 (8/55)**	27.8 (22/79)	**26.4 (14/53)**
5 years	20.5	**13.5**	27.1 (49/181)	**11.3 (16/141)**	15.5 (28/181)	**9.7 (13/134)**	20.0 (36/180)	**12.7 (17/134)**	19.4 (35/180)	**20.2 (22/109)**
18 years	8.5	**5.2**	11.1 (62/559)	**5.7 (27/473)**	6.8 (37/547)	**4.5 (21/466)**	8.1 (45/558)	**5.4 (25/465)**	8.1 (45/558)	**5.2 (24/462)**
65 years	8.4	**3.3**	18.5 (5/27)	**3.3 (1/30)**	11.5 (3/26)	**3.3 (1/30)**	3.7 (1/27)	**3.3 (1/30)**	0 (0/27)	**3.3 (1/30)**

< less than
≤ less than or equal to
≥ greater than or equal to

Quantity of water used per capita per day

The quantity of water used per capita per day is measured as the volume of water collected for each household divided by the number of people in the household. The type of water source and the amount of water used to perform household chores and to bathe impact the per capita daily water use. Water meters were installed in some study areas prior to the mid-term survey to estimate the daily per capita water use of homes with household spigots. Water meters were not installed in this study area because there are no household taps.

Per Capita Daily Water Use

Water usage in the participating households was calculated based on self-reported use of water collected and stored in culturally specific water containers. The average volume of water collected per person per day in the mid-term survey was 14 L (range: 3 to 101 L/person/day).

Twenty-six percent (27/103) of the households collected more than the Sphere guideline of 15 L/person/day and 1% (1/103) collected more than the USAID guideline of 50 L/person/day. The amount of water collected during the mid-term survey was about the same as that reported in the baseline survey, in which 26% (29/112) of the population collected more water than the Sphere guideline of 15 L/person/day and 0% (0/112) collected more water than the USAID guideline of 50 L/person/day. Both of these communities are located along rivers or creeks and there is little need to collect and store large volumes of water in the home.

Water Source and Volume Collected

The types and distribution of water sources changed after Hurricane Mitch and at the time of the midterm survey, and are expected to change again once the water interventions have been finalized. Figure 3.2.2.1 summarizes the water sources before Hurricane Mitch, at the time of the baseline survey, and at the time of the mid-term survey.

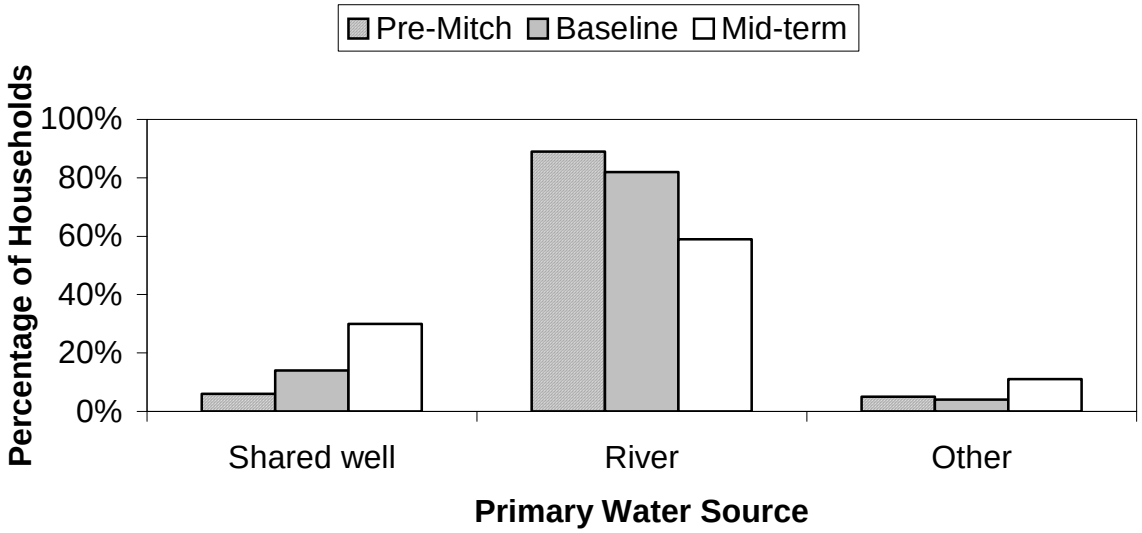

Figure 3.2.2.1 Water Source Before and After Hurricane Mitch and During the Mid-term Survey Nicaragua – Study Area 2 – Waspam, February 2001

Prior to the hurricane in 1998, 90% (101/112) of household water was obtained from the river. After Hurricane Mitch, at the time of the baseline survey, 82% (91/111) of the households obtained their water from the river, and at the time of the mid-term survey the percentage of water obtained from the river decreased to 59% (61/103). During this same time period, the percentage of water obtained from shared wells increased, from 6% (7/112) pre-hurricane, to 14% (16/111) at the time of the baseline survey, to 30% (31/103) at the time of the mid-term survey. The percentage of water obtained from springs also increased, from 4% (4/112) pre-hurricane and at the time of the baseline survey, to 11% (11/103) at the time of the mid-term survey.

The volume of water collected by water source is shown in Table 3.2.2.3. The shared well, river and spring generally provided the same average volume of water per household during the mid-term survey (100 to 111 L/day). The river provided about the same average amount of water

during both surveys, 100 liters (L) per day in the mid-term survey and 95 L/day in the baseline survey, while the river and spring provided more water during the mid-term survey compared to the baseline survey.

Table 3.2.2.3 Daily Volume of Water Collected in Each Household by Water Source
Nicaragua – Study Area 2 – Waspam, February 2001

Water Source	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=111	**2001 N=103**	2000	**2001**	2000	**2001**	2000	**2001**
Shared well	16	**31**	20-200	**38-380**	86	**111**	80	**76**
River/stream	91	**61**	20-220	**38-380**	95	**100**	80	**95**
Other (spring)	4	**11**	40-68	**38-205**	57	**109**	60	**95**

Water Meter Data
There is no water system in Waspam and meters were not installed in these study areas. (Table 3.2.2.4 is omitted in this section).

Access to Water
The temporal aspect of access to water was measured as the length of time each day people had to wait to get water and if a water source provided water year-round. Twenty-eight percent (29/103) of households in the mid-term survey reported that they had to wait to get water either some or all of the time. Of those who had to wait, 69% (20/29) of households had to wait less than 15 minutes for water, 28% (8/29) had to wait between 15 minutes and one-half hour, and 3% (1/29) said they had to wait between one-half hour and one hour. None of the study participants had to wait for more than one hour for water.

Twice as many study participants reported that they had to wait for water during the mid-term survey than during the baseline survey. However, when compared with the baseline survey the time respondents waited for water decreased during the midterm survey. Of respondents who had to wait for water, the percentage that waited for less than 15 minutes increased from 53% (8/15), the percentage that waited from 15 minutes to one-half hour increased from 13% (2/15), and the percentage that waited between one-half hour and one hour decreased from 7%. During the baseline survey, 27% (4/15) of the participants had to wait for more than one hour in the baseline survey while none of the participants in the mid-term survey had to wait for more than one hour.

Nearly all of the households reported that their primary water source provided water all day long during the baseline survey (98% (110/112)) and during the mid-term survey (100% (103/103)). The percentage of households reporting that their primary water source provided water all year was lower. Eighty-three percent (85/103) of the participants reported having water all year long in the mid-term survey versus 94% (105/112) having water all year long in the baseline survey.

Home Water Use

The home water use variables assessed in the survey, summarized in Table 3.2.2.4, include the frequency and sites where participants washed clothes and bathed. In the mid-term survey, households reported washing clothes an average of 4 times a week (range: 1 to 14 times per week). One hundred percent (103/103) of households reported washing clothes in the river. One hundred percent (103/103) of households bathed in the same place they washed clothing. Seventy-one percent (73/103) of interviewees reported that they bathed daily. The remaining 29% (30/103) of respondents bathed with a variety of frequencies. Home water use remained about the same in the mid-term survey as reported in the baseline survey.

Table 3.2.2.5 Summary of Household Water Use
Nicaragua – Study Area 2 – Waspam, February 2001

Home Water Use	Baseline Survey 2000	*Mid-term Survey 2001*
Wash clothes	3.7 times/week	**4.3 times/week**
Wash clothes in a river/creek	100% (112/112)	**100% (103/103)**
Bathe where they wash clothes	99% (111/112)	**100% (103/103)**
Bathe daily	97% (109/112)	**71% (73/103)**
Bathe at other frequency	3% (3/112)	**29% (30/103)**

Percentage of child caregivers and food preparers with appropriate hand washing behavior

The assessment of appropriate hand washing knowledge and behavior was based on the interviewees' ability to recite critical times at which they wash their hands and to demonstrate good hand washing technique. Proper hand washing is one of the most effective ways to break the fecal-oral route of disease transmission. Hand washing knowledge was self-reported and behaviors were observed and scored by the interviewer. A passing score is eight or more correct responses out of ten (8/10) (Billig et al., 1999). Unanswered questions were considered a "no" response. Part of the ARC interventions includes health education that should increase the knowledge and practice of proper hand washing. Hand washing knowledge and behavior of the primary child caregiver and food preparer are shown in Tables 3.2.2.6 and 3.2.2.7.

Primary Child Caregiver

Comparison of the mid-term and baseline surveys shows that there was an increase in the number of primary child caregivers with passing scores of 8/10 or greater from the baseline to the midterm survey: 54% (38/71) in the mid-term and 19% (19/102) in the baseline survey. Hand washing was most frequently reported before cooking for both surveys. Hand washing was least reported after cleaning a child's bottom during both surveys. During the mid-term survey, 97% (65/67) of the women used water to wash their hands and 76% (51/67) used soap. The scores for both hand washing knowledge and behavior improved from the baseline survey to the mid-term survey.

Table 3.2.2.6 Primary Child Caregiver Hand Washing Knowledge and Behavior
Nicaragua - Study Area 2 - Waspam, February 2001

Primary Child Caregiver		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you	Before eating	54% (55/102)	**75% (50/67)**

wash your hands? (knowledge)	Before cooking	75% (76/102)	**93% (62/67)**
	Before feeding children	31% (31/102)	**63% (42/67)**
	After defecating	52% (53/102)	**64% (43/67)**
	After cleaning children's bottom	25% (25/102)	**54% (36/67)**
How do you wash your hands? (behavior)	Use water	100% (103/103)	**97% (65/67)**
	Use soap	64% (66/103)	**76% (51/67)**
	Use both hands	94% (97/103)	**96% (64/67)**
	Rub hands 3 times	52% (53/102)	**72% (48/67)**
	Dry hands on towel or air dry	33% (34/103)	**52% (35/67)**
Total passing score (8 of 10)		19% (19/102)	**54% (38/71)**

≥ greater than or equal to

Household Food Preparer

Comparison of the mid-term and baseline surveys shows that there was an increase in the number of passing scores of 8/10 or greater from the baseline to the mid-term survey: 45% (46/103) in the mid-term compared to 17% (19/112) in the baseline survey. Hand washing was most frequently reported before cooking in both surveys. Hand washing was least reported after cleaning a child's bottom in both surveys. During the mid-term survey, 97% (100/103) of the women used water to wash their hands and 75% (77/103) used soap. The mid-term results for hand washing behavior improved from the baseline survey, with more participants rubbing their hands more than three times during the demonstration, and more participants drying their hands in a sanitary manner.

Table 3.2.2.7 Household Food Preparer Hand washing Knowledge and Behavior
Nicaragua - Study Area 2 - Waspam, February 2001

Household Food Preparer		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	51% (57/112)	**70% (72/103)**
	Before cooking	79% (88/112)	**92% (95/103)**
	Before feeding children	26% (29/111)	**50% (51/103)**
	After defecating	46% (52/112)	**66% (68/103)**
	After cleaning children's bottom	18% (20/112)	**44% (45/103)**
How do you wash your hands? (behavior)	Use water	99% (110/111)	**97% (100/103)**
	Use soap	60% (66/110)	**75% (77/103)**
	Use both hands	93% (103/111)	**92% (95/103)**
	Rub hands. 3 times	52% (57/110)	**67% (69/103)**
	Dry hands on towel or air dry	25% (27/109)	**50% (52/103)**
Total passing score (8 of 10)		17% (19/112)	**45% (46/103)**

≥ greater than or equal to

People living in households where there are no children will be less likely to report hand washing activity before or after interaction with children. However, no differences in scoring were made to account for the fact that people who do not live with young children would be less likely to think of these answers than those living with young children. Therefore, the overall hand washing scores of primary child caregivers and food preparers in households with children less than three years of age and households with no children less than three were compared. For the primary child caregiver, 50% (26/52) of those with children less than three years old had a passing hand washing score compared to only 24% (12/51) of households with no children less than three. Results for the food preparer were similar with 50% (26/52) of households who had children less than three years old receiving a passing score, compared to 39% (20/51) of food preparers with no children less than three years old receiving a passing score. Results between the two groups demonstrate that primary child caregivers and food preparers with children are more likely to have a passing hand washing score than those who do not have children.

Hand Washing Education

The Ministry of Health conducted a majority of the health education workshops (charlas) focusing on hand washing behavior that were reported by the study participants during the mid-term survey. The mid-term survey showed that 53% (55/103) of households reported receiving a charla on proper hand washing behavior. This is a slight increase from the baseline survey, in which 46% (48/105) received a charla (Figure 3.2.2.2) and the majority of the charlas were given by Accion Medica, a local NGO, and the Ministry of Health. Most of the charlas reported in the mid-term survey were given at the home or at the health post with the female head of household or with the entire community.

The results showed that 42% (23/55) of the primary child caregivers and 51% (28/55) of food preparers who received a charla on hand washing had a passing hand washing score. For those who did not receive a charla, only 31% (15/48) of the primary child caregivers and 38% (18/48) of the food preparers had a passing hand washing score (Figure 3.2.2.2).

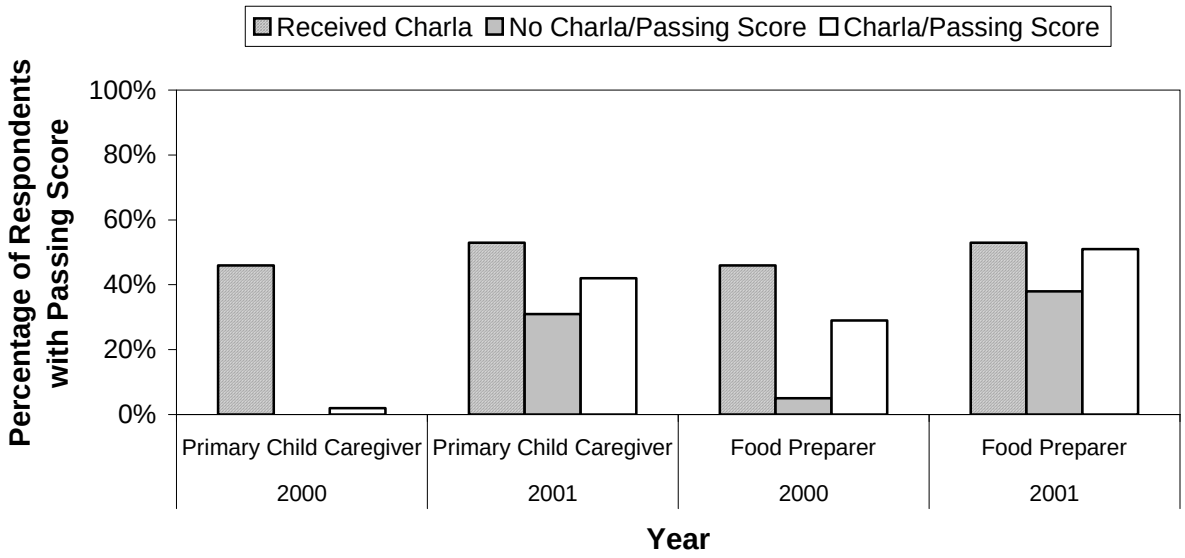

Figure 3.2.2.2 Comparison of Health Education and Hand Washing Scores
Nicaragua – Study Area 2 - Waspam, February 2001

Percentage of population using hygienic sanitation facilities

Proper disposal of excreta is essential to protect the health of the community members, particularly children. This indicator focuses on the percentage of the population that used hygienic sanitation facilities, where a sanitation facility is defined as a functioning toilet or latrine where excreta are disposed. This indicator was met if the facility was hygienic and used by household members greater than 12 months of age.

A facility was considered hygienic if there were less than three flies present and no excreta were found outside the latrine. It was considered in use if the latrine had one or more of the following conditions: it had been recently cleaned with water, there was a path to the latrine, there were signs of recently being swept, there were signs of recent repair, and there were no spider webs.

Use of Hygienic Facilities

Table 3.2.2.8 is a summary of the characteristics of the sanitation facilities. The number of people using a latrine increased during the mid-term survey compared to the baseline survey. However, the number of hygienic latrines that were in use and hygienic decreased. More of the study participants disposed of a baby's waste in a latrine during the mid-term survey than during the baseline survey and fewer participants reported disposing of a baby's waste in a river or creek. However, the percentage of participants reporting disposal of waste in places other than a latrine also increased during the midterm survey. Hand washing areas, on average, were located about the same distance from the latrines during the mid-term and baseline surveys.

Table 3.2.2.8 Sanitation Facility-Use and Practice
Nicaragua - Study Area 2 - Waspam, February 2001

Sanitation Facilities	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**

Total population >12 months using a latrine	16% (141/893)	**22% (163/741)**
Latrines that are hygienic and in use *	88% (15/17)	**79% (19/24)**
Population >12 months of age using a hygienic* latrine	13% (114/893)	**17% (125/743)**
Dispose of baby's** waste in a latrine	4% (3/75)	**8% (3/40)**
Dispose of baby's waste not in a latrine	59% (44/75)	**63% (25/40)**
Dispose of baby's waste in river/creek	37% (28/75)	**30% (12/40)**
Mean distance to hand washing area	28 m	**30 m**

* Hygienic if <3 flies present and no excreta are found outside the latrine. In Use if latrine has one or more of the following, recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
** baby defined as a child less than 12 months of age
>greater than

Education on Care and Use of Latrines

The Ministry of Health conducted a majority of the health education workshops (charlas) focusing on the care and use of latrines that were reported by the study participants. The mid-term survey showed that 39% (40/103) of households reported receiving a charla on the care and use of latrines, an increase from the baseline survey, in which 18% (20/110) of the households received a charla (3.2.2.3), and the majority of these charlas were given by Accion Medica, a local NGO, and the Ministry of Health reaching of the households. Most charlas in the mid-term survey were given in the home or at the school with the female head of household, with families, or the entire community.

The mid-term results showed that 28% (11/40) of the survey participants who had received a charla on the care and use of latrines of latrines had hygienic latrines. Seventeen percent (11/63) of those who did not receive a charla had hygienic latrines (Figure 3.2.2.3).

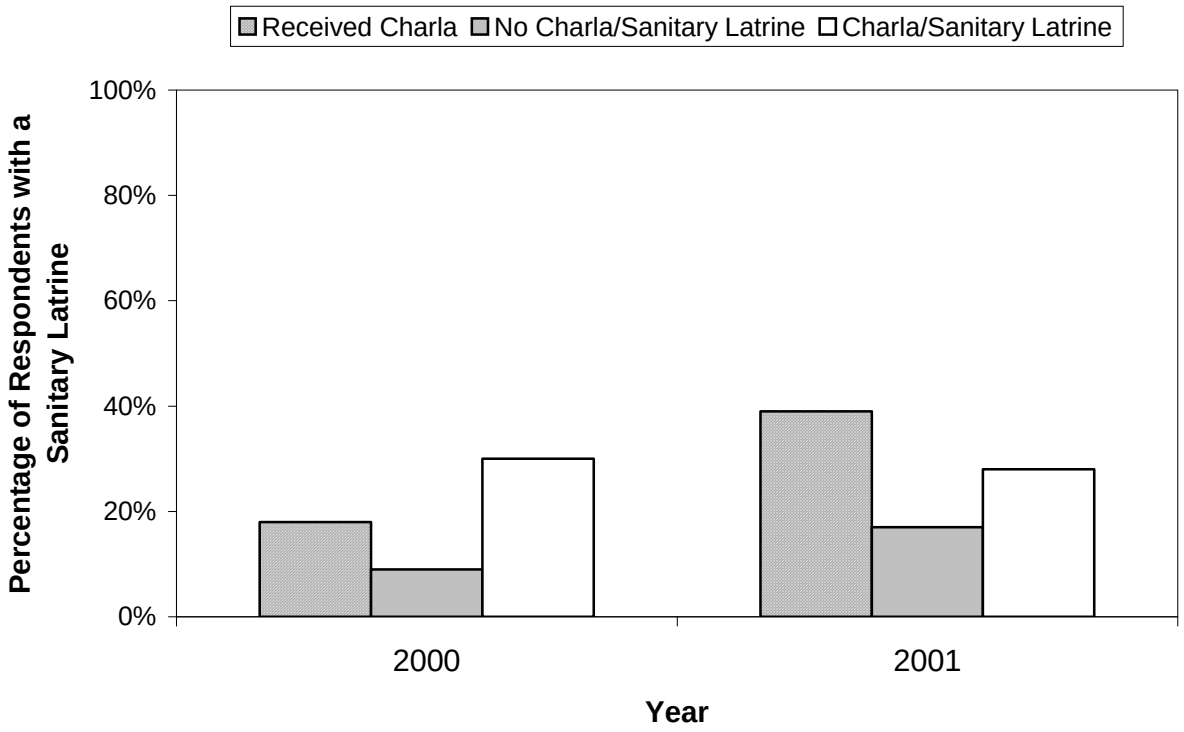

Figure 3.2.2.3 Comparison of Health Education and Sanitary Latrines
Nicaragua – Study Area 2 - Waspam, February 2001

Monitoring Indicators

Percentage of households with year-round access to water

This indicator is a measure of the homes that have an adequate public, private, or shared water source that is located within 200 meters of the home and is used for drinking, cooking, cleaning, and bathing. No particular level of water quality is implied. Water sources defined as "adequate" may include protected wells and springs, but do not include untreated surface waters. During the mid-term survey, 17% (18/103) of participating households reported that they had year-round access to an improved water source that was located within 200 m of the house. This increased from the baseline survey, in which 12% (13/111) of households reported using an improved water source within 200 m of the house. The average distance to an improved water source in the baseline survey was 67 m, which was slightly greater than average distance of 58 m reported in the mid-term survey. In Waspam, adequate water sources included a shared well and a spring.

Prior to Hurricane Mitch, households reported traveling an average of 328 m to get water (median 48 m) with a range of 0 m to 12 km. After Hurricane Mitch, at the time of the baseline survey, the median distance traveled to get water decreased to 23 m. The distance households traveled to their water source during the mid-term survey ranged from 2 meters (m) to greater than 1 kilometer (km), with a mean distance of 202 m. The median distance traveled to get water during the midterm survey increased to 100 m.

Interviewer estimates of distance from the interviewed household to its water source during the mid-term survey were about the same with a range of 4 m to greater than 1 km, a mean distance of 184 m, and a median distance of 100 m. According to interviewer estimates, 70% (72/103) of the households had water sources within 200 m of the household. As shown in Table 3.2.2.9, at the time of the baseline survey, the volume of water collected did not appear to have any association with the distance traveled to collect it.

Table 3.2.2.9 Daily Volume of Water Collected in Relation to Distance from Household to Water Source
Nicaragua – Study Area 2 – Waspam, February 2001

Distance (meters)	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=112	**2001 N=103**	2000	**2001**	2000	**2001**	2000	**2001**
≤ 10	6	**6**	40-200	**57-133**	93	**79**	70	**67**
11-50	37	**31**	20-200	**38-380**	100	**129**	80	**114**
51-100	23	**20**	20-200	**38-228**	78	**104**	60	**76**
101-200	26	**15**	40-200	**38-190**	102	**82**	100	**57**
201-500	10	**23**	20-100	**38-218**	77	**86**	84	**76**
501-998	6	**4**	60-220	**38-57**	110	**52**	100	**57**
≥ 999	4	**4**	80-120	**76-304**	95	**200**	90	**209**

≤ less than or equal to
≥ greater than or equal to

Percentage of households with access to a sanitation facility

Households were considered to have access to a sanitation facility if that household had a private facility or shared a facility with others in a community. During the mid-term survey, the percentage of households that reported having access to a sanitation facility increased to 26% (27/103) from 21% (23/112) during the baseline survey (Table 3.2.2.10). During the mid-term survey, most facilities were privately owned dry pit latrines (Table 3.2.2.10).

Table 3.2.2.10 Household Access and Description of Sanitation Facilities
Nicaragua - Study Area 2 - Waspam, February 2001

Sanitation Facility	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Access to a latrine	21% (23/112)	**26% (27/103)**
Number of latrines inspected	23	**27**
Private facility	91% (21/23)	**85% (23/27)**
Shared facility	2% (2/23)	**15% (4/27)**
Dry pit latrines	100% (23/23)	**89% (24/27)**
Compost latrines	0% (0/23)	**11% (3/27)**

Percentage of recurrent costs for water supply services provided by the community served
This indicator cannot be assessed until the water supply interventions are completed.

Percentage of constructed water supply systems operated and maintained by the communities served

This indicator cannot be assessed until the water supply systems are completed in all study areas.

Water Quality Testing

The results of the analyses of the community sources and household water samples are summarized in Table 3.2.2.11. All water samples were analyzed using the portable DelAgua

Water Testing Kit and total coliforms and *E. coli* were quantified and reported as colony forming units per 100 ml of water (CFU/100 ml). A subset of samples was analyzed in duplicate using the DelAgua kit, and a subset of samples was analyzed by a qualitative test using the PurTest kit to confirm the presence or absence of total coliforms and *E. coli*. A sterile water blank was analyzed with each batch of samples to verify that sterile conditions were being maintained.

Table 3.2.2.11 Community and Household Water Sources Receiving Treatment and Coliform Results
Nicaragua - Study Area 2 - Waspam, February 2001

Water Tested		Sample Size (N)		Water Treated		Percent of Samples Positive for Total Coliforms		Percent of Samples Positive for *E. coli*	
Year		2000	**2001**	2000	**2001**	2000*	**2001**	2000	**2001**
Community source	All	7	**8**	0%	**0%**	87% (6/7)	**100% (8/8)**	87% (6/7)	**63% (5/8)**
	Andres	3	**3**	0%	**0%**	100% (3/3)	**100% (3/3)**	100% (3/3)	**100% (3/3)**
	Kum	4	**5**	0%	**0%**	75% (3/4)	**100% (5/5)**	75% (3/4)	**40% (2/5)**
Household samples	All	11	**12**	27% (3/11)	**25% (3/12)**	82% (9/11)	**100% (12/12)**	82% (9/11)	**83% (10/12)**
	Andres	5	**6**	40% (2/5)	**33% (2/6)**	80% (4/5)	**100% (6/6)**	80% (4/5)	**80% (5/6)**
	Kum	7	6	17% (1/7)	**17% (1/6)**	83% (5/6)	**100% (6/6)**	83% (5/6)	**83% (5/6)**

* Results reported in the baseline are fecal coliforms.

Community Water Source
Eight community water sources were sampled during the mid-term survey, three in Andres and five in Kum. Community water sources that were sampled included the Rio Coco, a tributary to the Rio Coco, and shared community wells. All community water samples were contaminated with total coliforms and five of eight were contaminated with *E. coli*. Total coliforms results ranged from 5 CFU/100 ml to too numerous to count (TNTC). Two of the three ARC wells in Kum were not contaminated with *E. coli*, and the third contained 1 CFU *E. coli*/100 ml.

These results are similar to the results from the baseline survey that showed that six of the seven community water samples were contaminated with total coliforms and *E. coli.* The ARC well that had been built in Kum at the time of the baseline survey was not contaminated with *E. coli*. This well also tested negative for *E. coli* at the time of the mid-term survey.

Household Water Samples
During the mid-term survey, water samples were taken from water stored in 12 households for drinking. Household water samples were taken from water stored in the house for drinking. As

shown in Table 3.2.2.11, 100% (12/12) of the samples were contaminated with total coliforms and 83% (10/12) with *E. coli*. Positive samples ranged from 46 CFU/100 ml to TNTC for total coliforms and 1 CFU/100 ml to TNTC for *E. coli*.

Fifteen percent (15/103) of all households reported treating their water on the day of the interview. Of the twelve households where water was sampled, 25% (3/12) treated their water that day. The stored household water in each of these three households was contaminated with total coliforms and two of the three samples contained *E. coli*. All of the water samples taken at the remaining nine households that did not treat their water on the day of the interview contained total coliforms and *E. coli*. However, one water sample in Andres contained only 1 CFU/100 ml of *E. coli*.

The percentage of contaminated water samples during the mid-term survey was compared to the percentage testing positive during the baseline survey. Nearly all of the household water samples taken during both the mid-term and baseline surveys contained total coliforms and *E. coli*. Thus, both surveys indicate that the household water samples were contaminated with fecal material.

Quality Assurance
One water sample was analyzed in duplicate using the DelAgua kit, and identical results were obtained for the duplicate samples. No bacteria grew in the sterile water blanks analyzed, indicating that sterile conditions were adequately maintained during processing of the water samples.

The results of the qualitative analyses run using the PurTest kit confirmed the results of the analysis using the DelAgua kit. Two community samples were analyzed using the PurTest kit, one from a creek in Kum and the other from the Rio Coco in Andres. Both samples tested positive for total coliforms and *E. coli* using both the PurTest kit and the DelAgua test kit. The four household water samples that were analyzed using the PurTest kit were also positive for total coliforms and *E. coli,* confirming the results using the DelAgua test kit.

Storage, Handling and Treatment
A summary of the way water is stored, handled, and treated in the home is shown in Table 3.2.2.12. Water in the home was generally stored and handled similarly in the mid-term and the baseline survey. However, slightly more of the households in the mid-term survey covered their water than during the baseline survey. Fewer people treated their water the day of the survey and always or sometimes treated their water during the mid-term survey than during the baseline survey, but those who reported treating their water predominantly used chlorine. During the baseline survey, 8% of participants reported treating their drinking water by filtration. However, during the mid-term survey, none of the participants indicated that they filtered their water, and 1% of participants reported that they used boiling as and alternate method of water treatment.

Table 3.2.2.12 Summary of Water Storage, Handling and Treatment
Nicaragua - Study Area 2 – Waspam, February 2001

Technique	Baseline Survey 2000	*Mid-term Survey 2001*
Storage and Handling		
Store water at home	98% (110/112)	**94% (97/103)**
Stored drinking water	98% (110/112)	**94% (97/103)**
Covered drinking water	64% (70/109)	**70% (70/100)**
Dip in a cup for water	86% (93/108)	**88% (91/103)**
Pour water into a cup/glass	1% (1/108)	**1% (1/103)**
Treatment		
Treated water day of survey	30% (34/112)	**15% (15/103)**
Always treated their water	20% (22/111)	**3% (3/103)**
Sometimes treated their water	56% (62/111)	**65% (67/103)**
Never treated their water	24% (27/111)	**32% (33/103)**
Treat water with chlorine	63% (71/112)	**89% (66/74)**
Other method of treatment	8% (9/112)	**1% (1/74)**

Water Treatment Education
The Ministry of Health focusing on proper storage and treatment of water reported by the study participants in the mid-term survey, whereas the Accion Medica, a local NGO, and the Ministry of Health conducted a majority of the health education charlas during the baseline survey. The survey showed that 64% (66/103) of households reported receiving a charla on how to treat household water, compared to 53% (57/108) during the baseline survey. Most of the charlas in the mid-term survey were given in the home or at the local school to the female head of household or the entire community.

There was no apparent difference in the storage and handling of household water by study participants who did and did not receive a charla on proper storage, handling and treatment of household water; however, some improvements were made in water treatment. Figure 3.2.2.4 summarizes the observed activities for those who did and did not receive charlas on the storage and handling of household water.

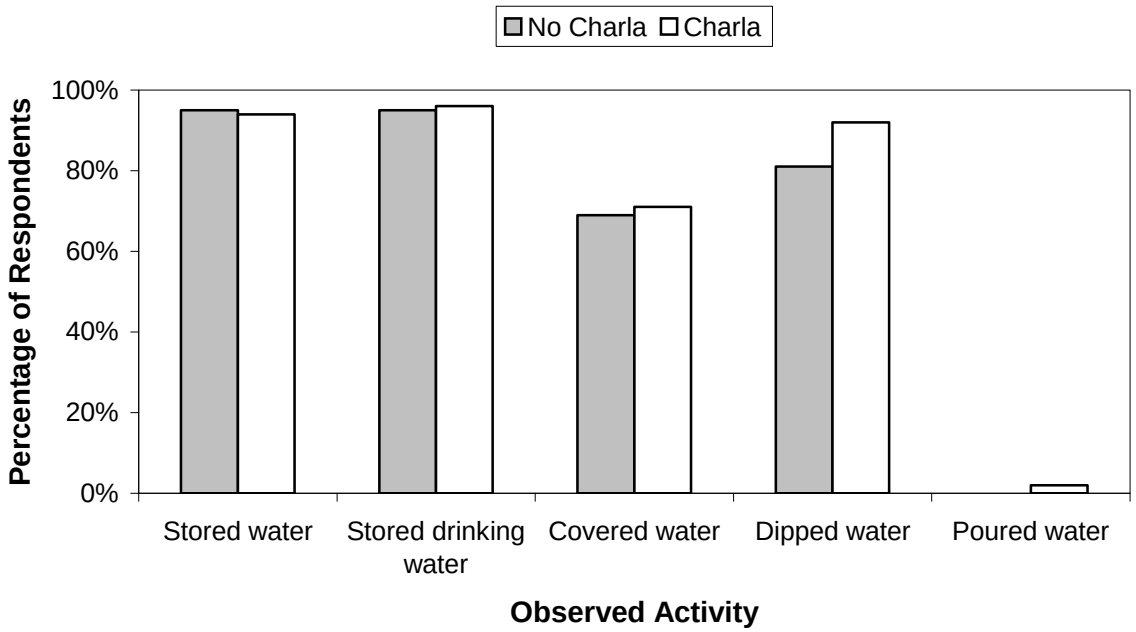

Figure 3.2.2.4 Water Storage Activities Observed by Interviewer in Relation to Receiving a Charla on Proper Storage and Handling of Water
Nicaragua – Study Area 2 – Waspam, February 2001

Figure 3.2.2.5 is a summary of reported activities for those who did or did not receive a charla on water treatment. Slightly fewer of the study participants who received a charla treated their water than those who had not received a charla. Slightly more study participants who received a charla used chlorine as a method of water treatment, and 50% more of those who received a charla on water treatment reported that they treated their water at least sometimes. Very few study participants reported treating their water by boiling, regardless of whether they had received a charla on water treatment.

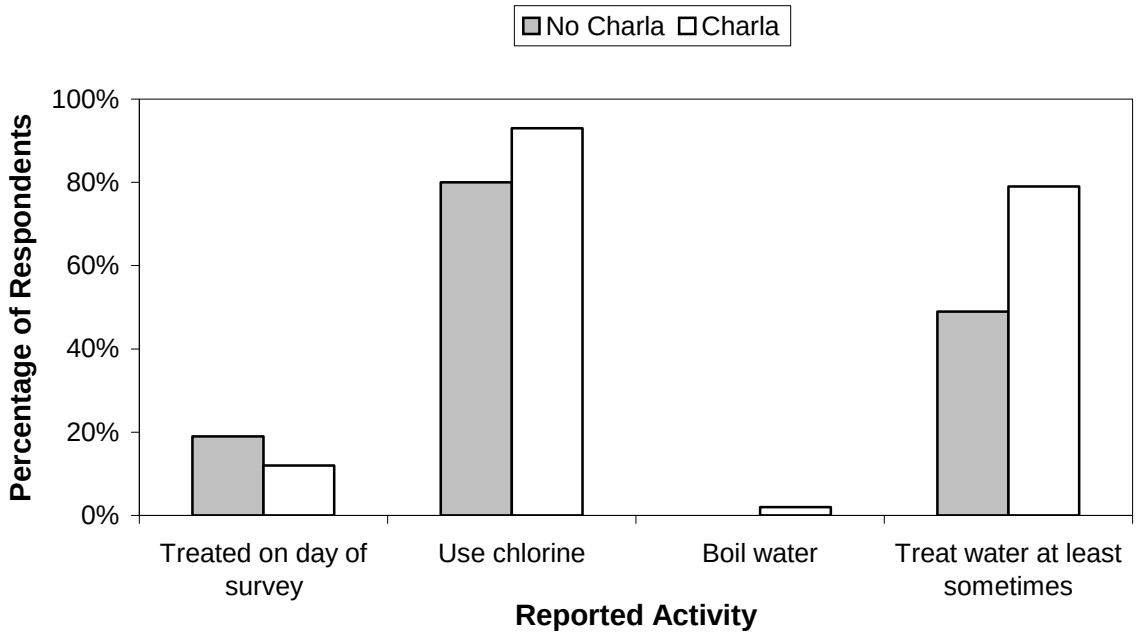

Figure 3.2.2.5 Water Treatment Activities Reported by Study Participants in Relation to Receiving a Charla on Proper Treatment of Water
Nicaragua – Study Area 2 – Waspam, February 2001

Water samples were taken from seven households that reported receiving education on proper water treatment. Five of the seven homes' stored water tested positive for total coliform bacteria and *E. coli*. One additional household water sample, from a household that reported not having treated their water on the day of the survey, apparently contained 1 CFU/100 ml of E. coli, but no other total coliform bacteria were detected. This result is unusual, and could be due to a failure of the procedure used to sterilize the filtration apparatus. The water sample taken at one household that reported receiving education on proper water treatment was not contaminated. This household reported treating their water on the day of the survey. Household water samples were also taken from five households that reported that they had received no education on proper water treatment techniques. The water samples from all of these households tested positive for both total coliforms and *E.coli*, regardless of whether they reported treating their water the day of the survey.

Discussion

The baseline and mid-term survey USAID Impact Indicators in Waspam are summarized in Table 3.2.2.13. Comparison of these data shows that the interventions are improving the health of the community and use of hygienic hand washing techniques. It should be recognized that the interventions are in progress and the final survey in February 2002 will clearly define the impact of the interventions on this community. Nevertheless, at the time of the mid-term survey, goals were already met for three of the seven indicators.

Table 3.2.2.13 Performance Indicators
Nicaragua - Study Area 2 - Waspam, February 2001

Performance Indicator	USAID Guideline	Status During Baseline Survey (2000)	Final Goal (2002)	Status During Mid-term Survey (2001)	Percent Difference : Baseline to Mid-term[1]	Progress To Goal: Baseline to Mid-term[2]	Status Relative to Final Goal[3]
Impact Indicator							
Children under <36 months with diarrhea in the last 2 weeks[4]	25% decrease	49 (50/102)	≤37	31 (24/77)	37% decrease	NA	>100%
Quantity of water used per capita per day	100% using 50 Lpd	0% (112/112)	100%	1% (1/103)	NA	1% increase	1%
Child caregiver with appropriate hand washing behavior	50% increase	19% (19/102)	≥29%	54% (38/71)	184% increase	NA	>100%
Food preparers with appropriate hand washing behavior	50% increase	17% (19/112)	≥26%	45% (46/103)	165% increase	NA	>100%
Population using hygienic sanitation facilities[5]	75% usage	13% (114/893)	≥75%	17% (125/741)	NA	4% increase	23%
Monitoring Indicator							
Households with year-round access to water[6]	NE	12% (13/111)	100%[7]	17% (18/103)	NA	5% increase	17%
Households with access to a sanitation facility	NE	21% (23/112)	100%[7]	26% (27/103)	NA	5% increase	26%

1 Calculated ONLY for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values
2 Calculated ONLY for indicators with goals with an absolute goal (e.g., 100%) by subtracting the baseline value from the mid-term value
3 Status with respect to the final goal for each indicator, calculated for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values divided by the goal, calculated for those with an absolute goal (e.g., 100%) by dividing the mid-term value by the goal; >100% indicates that the goal was exceeded

4 Goal is a reduction in the number of cases of diarrhea per 100 children in the study population.
5 A facility is considered hygienic if there are less than 3 flies present and no excreta are found outside the latrine. A latrine is IN USE if latrine it has one or more of the following conditions: recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
6 Water source is less than 200 meters away from the household and there is access to water year-round.
7 Goal was established by the American Red Cross
NE none established

Impact Indicators

The overall period prevalence of diarrhea in all children less than 36 months decreased from 49 per 100 children during the baseline survey to 31 per 100 children during the mid-term survey and met the proposed final goal for this indicator of a 25% decrease in period prevalence of diarrhea at the time of the mid-term survey. The period prevalence for diarrhea in the mid-term survey was about the same for children who were breast-feeding and those who were not breast-feeding. During the baseline survey, the period prevalence for diarrhea was higher in children who were breast-feeding compared to those who were not breast-feeding.

Active diarrhea surveillance was conducted with all household members in the household survey. The demographics of the populations surveyed during the two surveys were very similar. The average weekly diarrhea prevalence for all age groups was lower than during the baseline survey. The weekly prevalence of diarrhea for each age group by week was generally lower in the mid-term survey when compared to the baseline survey.

Although the interventions were still in progress in Waspam, the reduced diarrhea prevalence in Waspam at the time of the mid-term survey can probably be attributed to the use of the ARC-designed wells that provide the community with a sealed and protected source of ground water. Additionally, providing access for children to hygienic latrines at school and teaching appropriate hand washing behaviors may have contributed to the decrease in the prevalence of diarrhea in these communities. Although year-round access to an improved water source nearly doubled as ARC initiated its water interventions in Waspam, only 1% of households reported collecting 50 L water per person per day for household use. Water use in this study area is influenced by the fact that the communities are located adjacent to or in the vicinity of the Rio Coco. Results show that the river is used to perform household activities such as bathing and washing dishes and clothes. Because of their dependence on river water for nonpotable needs, the households in Waspam do not store large volumes of water in their houses. To account for potable water used for drinking, cooking, and personal and domestic hygiene, but excluding water that would be required for bathing and washing clothes, the appropriate goal for water use in Waspam is probably closer to 25 L water per person per day. Nine percent of households reported collecting 25 L water per person per day for household use. However, well construction is ongoing in Waspam, which will continue to increase access to potable water throughout the year. Because the people of Waspam are accustomed to using the river to fulfill their potable and nonpotable water needs, they may need encouragement and education about the benefits of using these water sources rather than the river. During the final survey in 2002, it will be important to determine the percentage of this population that obtains its drinking water from the

ARC wells, all of which were free from microbial contamination at the time of the mid-term survey.

In Waspam, the knowledge of when and how to wash hands effectively increased from the baseline survey to the mid-term survey. The percentage of people in Kum and Andres with passing hand washing scores increased from 19% to 54% for child caregivers and from 17% to 45% for food preparers. The child caregivers and food preparers who had participated in a training session were more likely to have a passing hand washing score than those who did not receive training. The percentage of people reporting they had received training in hand washing technique increased only slightly from 46% to 53%; however, the methodology used for the training had changed between the baseline and mid-term surveys, which may account for some of the increase in use of hygienic hand washing techniques.

Due to the hurricane, many of the latrines were lost or damaged beyond use in this study area. However because the ARC had built some school-based latrines by the time of the mid-term survey, slightly more of the population of Waspam was using hygienic latrines during the mid-term survey than during the baseline survey. Because construction of household latrines is still underway, the follow-up survey in 2002 is expected to show a dramatic increase in the access to latrines in Waspam. Meanwhile, the training about proper care and use of latrines appears to have met with some success. Households that participated in training focusing on proper care and use of latrines were more likely than those who had no training to use hygienic latrines. It is important that educational training about proper care and use of latrines continue as private latrines are constructed at each household.

Monitoring Indicators

Year-round access to an improved water source improved from 12% to 17% in Waspam between the baseline and mid-term surveys. Although ARC plans to build community wells in both Kum and Andres, at the mid-term survey, only 70% of households in Kum met the criteria for access to an improved water source. In Andres, where ARC had not yet built any wells, only 4% of water sources in use at the mid-term survey met these criteria. It is expected that once the wells planned by ARC are installed and the community is encouraged to use these wells, greater improvements will be seen in this indicator.

The ARC program is expected to achieve 100% latrine coverage, and will be beneficial for improving the health of the people of Waspam, particularly if it is followed by education on proper use of latrines and latrine maintenance. At the mid-term survey, ARC had completed two school-based latrines in Kum and was building household latrines in both Kum and Andres. In these communities, access to a sanitary facility had improved slightly from the baseline to the mid-term survey, with full latrine coverage expected by February 2002.

Water Quality Analysis

The microbial quality of the water sources used by the population of Waspam improved slightly from the baseline survey to the mid-term survey. Eighty-seven percent of the samples taken from the shared community wells tested positive for *E. coli* during the baseline survey, compared to 63% during the mid-term survey. The three water sources that were not contaminated with *E. coli* during the mid-term survey were the three ARC wells that had been installed in Kum. However, similar levels of household water samples tested positive for *E. coli* during the

baseline and mid-term surveys, 80% and 83%, respectively, indicating that collection and handling of the water is an important source of contamination in these communities. Unfortunately, although the percentage of participants who reported receiving training on water collection and storage techniques increased from 53% to 64% between the baseline and mid-term surveys, the training did not appear to affect how the study participants handled their water. The percentage who reported receiving training and who treated their water on the day of the survey was slightly lower than those who had not been trained, and both were under 20%. Additionally, few of either group used sanitary means of obtaining water from their storage container (6% and 11%, respectively).

The reduced diarrhea prevalence in Waspam at the mid-term survey probably can be attributed to the use of the ARC-designed wells that provide the community with a sealed and protected source of ground water. The increase in the percentage of households with access to improved water sources could be considered the most significant indicator for measuring the health impact of the intervention in the community, and if the access to improved water sources cannot be maintained in Waspam, the community health benefits will probably be short lived. Therefore maintaining the physical integrity and water quality of the wells in Waspam is essential to sustaining improvements to the health of the community.

Recommendations

The results of the mid-term survey showed that, although the ARC water and sanitation interventions had not been completed, the ARC interventions completed so far have been effective in improving community health following a natural disaster, as demonstrated by the decrease in the prevalence of diarrhea in children less than 36 months of age. The CDC recommends that the ARC continue to focus on completion of the following tasks so that all proposed goals are met by the time the final survey is performed.

Water

The CDC recommends should education programs should continue to encourage use of the ARC wells, which have been demonstrated to be free of fecal contamination. Wells should also be monitored regularly to ensure that the water quality remains good and that there are no changes in the integrity of the well. Education on proper water collection, storage and treatments techniques will be important to promote better handling and use.

Sanitation

Once the latrine intervention is completed, ARC should confirm that there is adequate access to the community. Education on the care and use of latrines should be continued.

Water Quality Testing

The results from water quality testing demonstrated that household water supplies were contaminated with *E. coli*, and suggests the following recommendations:

- The community water supply should be monitored and treated with chlorine to ensure that clean water is available to the residents of Waspam.

- Results showed that even when education was provided, household samples tested positive for *E.coli*. Education on water treatment and care should continue throughout the community to ensure that household water is handled appropriately.

El Salvador

Study Area 1 - Las Pozas

The baseline study was conducted in Las Pozas III on February 3, 2000 with a team of eight interviewers, the ARC in-country water and sanitation delegate, and one CDC investigator. There were 184 households in the community with a population of 110; however, many of these houses were not permanently occupied at the time of the baseline survey. A census of the inhabited houses was taken and 98 interviews were conducted. There was almost universal participation in the study with 98% (97/99) of the people contacted agreeing to participate.

Due to two major earthquakes experienced in El Salvador on January 13 and February 13, 2001, the ARC in-country water and sanitation delegate and the volunteers from the El Salvadorean Red Cross were not able to participate in the data collection aspect of the mid-term study. The health delegate from the El Salvadorean Red Cross participated in the data collection process supported by the ARC in-country water and sanitation delegate from Guatemala and the staff of the Guatemalan Red Cross. A team of eight interviewers including the health delegate, the ARC in-country water and sanitation delegate from Guatemala, and one CDC investigator traveled by car to Las Pozas from San Salvador on February 13, 2001. At the time of the mid-tem survey, the population in Las Pozas II and III was approximately 2000 with 530 houses. However, only half of the population lived permanently in the community. Upon arrival to the town, each interviewer was assigned to a different section of the town in which to conduct interviews. A member of the local health brigade assisted each interviewer in locating inhabited houses. A census of all of the inhabited houses was conducted and 102 interviews were completed. The CDC investigator collected 10 samples from household water sources and four samples from community water sources. There was almost universal participation in the study, with 97% (102/105) of the people contacted agreeing to participate. More than half (55%, 48/87) of the households reported having participated in the study the previous year

Community Description

The CDC conducted a survey with the coordinator of the water committee and the ARC wat-san delegate from Guatemala to obtain general information about the community and their water-use practices.

Las Pozas is located in a rural area approximately 20 kilometers off the main highway. The terrain is flat and a small river flows around the community. There are no shops or schools in the community. Houses are located on city blocks separated by unpaved streets. Las Pozas is divided into three sections (I, II, and III). These sections were created based on reasons people have relocated to this area. The ARC has programs in the Poza II and Poza III sections, which are the sections for the people affected by Hurricane Mitch. The people living in the other sections of Las Pozas located there for different reasons, for example, because they are victims from the civil war. At the time of the mid-term survey, the total number of households in section Poza II was 184 with a population of 968 people. Only 2/3 of the households were occupied full-time. The total number of households in section Poza III was 536 with a population of 1100 people, and only 1/3 of the households were occupied full-time. For the remainder of this report, Pozas II and III will be referred to as Las Pozas.

At the time of the mid-term survey, the majority of the population in Las Pozas had two years of primary education. The main occupation in the community was construction and manual labor in agriculture. The principal need of the community at that time, as described by community leaders, was employment and education.

Demographic Information

The mean household size was 4.2 people per household, which is greater than the household size in the baseline survey of 3.8 people per household. On average, 0.5 children less than 36 months of age lived in each house, which is the same as in the baseline survey. In the mid-term survey 91% (93/102) of participants reported living in their own home, 6% (6/102) lived with friends or family, and 3% (3/102) lived in a temporary house. These percentages on household residence were very different from the baseline survey, in which 15% (15/98) of participants lived in their own home, 83% (81/98) lived in temporary homes, and 2% (2/98) lived with friends or family. This indicates that most of the houses in the resettlement community had been constructed at the time of the mid-term survey.

Education

The mean educational level reported by household participants during the mid-term survey was 2.3 years, which is the same as in the baseline survey. The interviewees had zero to 11 years of formal education. The education level of the participants increased slightly from the baseline survey, during which 53% (51/97) of those interviewed reported that they had no formal education and 39% (38/97) had at least six years of education, to the mid-term survey, during which 48% (49/102) of the interviewees reported that they had no formal education and 42% (43/102) of interviewees had completed at least six years of education.

Status of Intervention

The interventions planned by the ARC were community-specific and based on existing resources and needs. Table 3.3.1.1 summarizes the perceived community need before the intervention (i.e., February 2000) and the ARC planned intervention. Additionally, this table lists the status of each intervention at the time of the mid-term survey. Many of the planned interventions had been completed at the time of the mid-term survey.

Construction was almost complete on the ARC-built composting latrines at the time of the mid-term survey. However, the January 13th earthquake had delayed construction and damaged some of the latrines that were already constructed. At the time of the mid-term survey, there was no ARC water intervention in the community and the community relied on the use of community wells, as they had at the time of the baseline survey.

The water system planned for the community by CARE will deliver piped water to the houses. It will be a spring fed gravity powered water system with each household having a private spigot. The completion of the water system was also delayed because of minor damages suffered by the January 13th earthquake and was scheduled to be completed on March 1, 2001.
A health education campaign directed to housewives on the use and care of latrines, hygiene, including proper hand washing techniques, and the use and treatment of household water was in place at the time of the mid-term survey. Classes had been held in the community every three weeks since January 2000 and were scheduled for completion in April 2001.

Table 3.3.1.1 Community Needs, Planned Interventions and Status of Interventions
El Salvador - Study Area 1 - Las Pozas, February 2001

Country/ Study Area	Perceived Community Need	Planned Intervention	Status of Intervention as of February 2001
El Salvador- Las Pozas	Employment	• Water system ♦More household latrines + Education program-hygiene	• Water storage tanks installed by CARE 80% complete; water committee established ♦Latrines under construction, some damage by Jan. and Feb. 2001 earthquake + Hygiene and sanitation education 90% complete, done by ARC and CARE

Performance Indicators

Impact Indicators

Percentage of children under <36 months with diarrhea in the last two weeks

Table 3.3.1.2 summarizes the reported diarrhea prevalence and breast-feeding practice among children less than 36 months of age in the two weeks prior to the baseline and mid-term surveys.

Table 3.3.1.2 Diarrhea Prevalence and Breast-feeding Practice in Children
El Salvador - Study Area 1 - Las Pozas, February 2001

Age	Period Prevalence of Diarrhea* (per 100 children)		Percent of Children Breast-fed		Period Prevalence of Diarrhea Breast-feeding (per 100 children)		Period Prevalence of Diarrhea Not Breast-feeding (per 100 children)	
Year	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
6 months	47 (7/15)	**42 (5/12)**	87% (13/15)	**92% (11/12)**	54 (7/13)	**36 (4/11)**	0 (0/2)	**100 (1/1)**
7-12 months	50 (1/2)	**80 (8/10)**	100% (2/2)	**70% (7/10)**	50 (1/2)	**71 (5/7)**	0 (0/0)	**100 (3/3)**
13-24 months	39 (9/23)	**41 (7/17)**	17% (4/23)	**47% (8/17)**	0 (0/4)	**38 (5/8)**	47 (9/19)	**44 (4/9)**
25-35 months	29 (2/7)	**22 (2/9)**	0% (0/7)	**11% (1/9)**	0 (0/0)	**0 (0/1)**	40 (2/7)	**25 (2/8)**
< 36 months	40 (19/47)	**46 (22/48)**	40% (19/47)	**55% (27/49)**	42 (8/19)	**44 (12/27)**	39 (11/28)	**48 (10/21)**

* Illness occurred within 2 weeks prior to the survey
< less than
≤ less than or equal to

The period prevalence of diarrhea in children less than 36 months of age increased slightly from 40 per 100 children in the baseline survey to 46 cases per 100 children in the mid-term survey. During the baseline and mid-term surveys, the second youngest age group (7-12 months) had the highest period prevalence and the oldest age group (25-35) had the lowest period prevalence.

The percentage of children who were breast-feeding increased from 40% (19/47) in the baseline study to 55% (27/49) in the mid-term study. This increase was reflected in the percentage of children breast-feeding in all of the age groups except for the 7 to 12 month age group. The period prevalence of diarrhea in breast-fed children increased slightly from 42 per 100 children in the baseline survey to 44 per 100 in the mid-term survey. However, the period prevalence of diarrhea in non-breastfeeding children increased more drastically, from 39 per 100 in the baseline survey to 48 per 100 in the mid-term survey, and the period prevalence of diarrhea in non breast-fed children surpassed that of breast-fed children during the mid-term survey.

Quantity of water used per capita per day

The quantity of water used per capita per day is measured as the volume of water collected for each household divided by the number of people in the household. The type of water source and the amount of water used to perform household chores and to bathe impact the per capita daily water use. Because the water system was not completed at the time of the mid-term study, water meters were not installed prior to the mid-term survey to estimate the daily per capita water use of homes with household spigots.

Per Capita Daily Water Use
The calculation of water usage in the participating households was based on self-reported use of water collected and stored in culturally specific water containers. In the mid-term study, the average volume of water collected per person per day was 131 L (range: 0-418 L/person/day). Seventy four percent (75/102) of the households used more than the Sphere guideline of 15 L/person/day and 17% (17/102) used more than the USAID guideline of 50 L/person/day. During the baseline study, the average volume of water collected per person per day was only 43 L (range: 0-264 Liters/person/day). However, during the baseline survey, 71% (70/98) of the study population was able to collect more water than the Sphere guideline of 15 L/person/day and 21% (21/98) collected more than the USAID guideline of 50 L/person/day.

Water Source and Volume Collected
The residents of Las Pozas used a variety of water sources. The types and distribution of water sources changed after Hurricane Mitch and at the time of the midterm survey, and are expected to change again once the water interventions have been finalized. Figure 3.3.1.1 shows the water sources before and after Hurricane Mitch and at the time of the baseline and mid-term surveys.

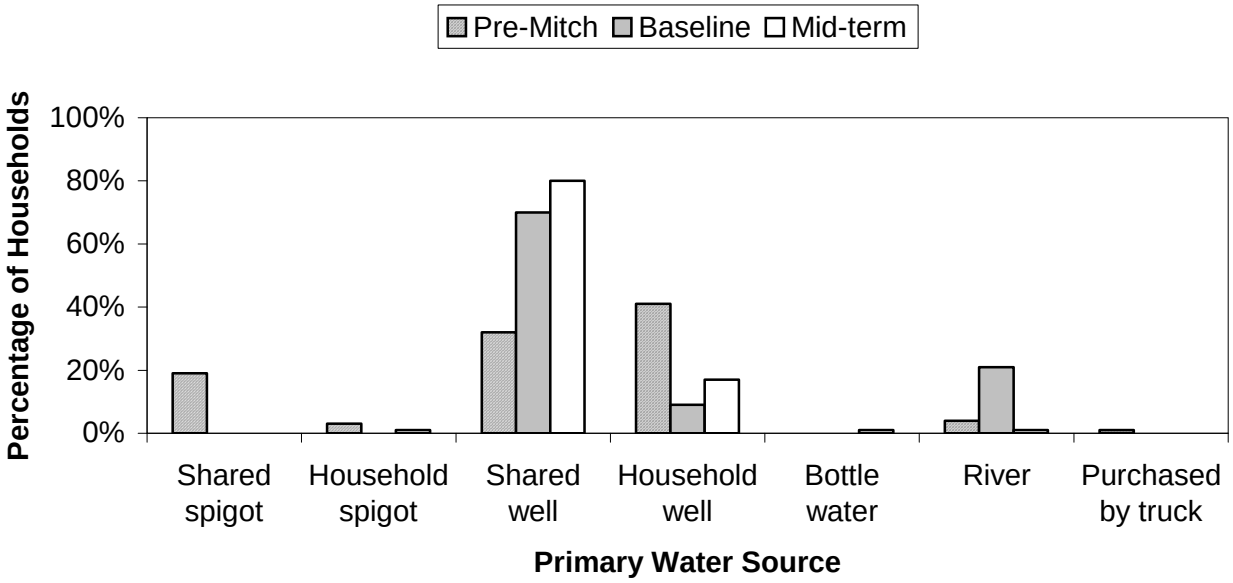

Figure 3.3.1.1 Water Sources Before and After Hurricane Mitch and During the Mid-term Survey
El Salvador – Study Area 1 - Las Pozas, February 2001

Prior to the hurricane, the greatest percentage of households (41%, 39/96) obtained water from household wells. After Hurricane Mitch, at the time of the baseline survey, the greatest percentage of households (70%, 67/96) obtained their water from shared wells and 9% (9/96) obtained their water from household wells. In the mid-term survey, the percentage of households obtaining their water from a shared well increased to 80% (82/102) and from households wells increased to 17% (17/102), and the percentage of households that obtained their water from the river decreased from 21% (20/96) to 1% (1/102).
The average volume of water collected during the baseline and midterm surveys is shown in

Table 3.3.1.3, stratified by water source. During the mid-term survey, similar volumes of water were obtained, on average, from households using shared wells (133 L/day), household wells (132 L/day) and a household spigot (130 L/day). However, both shared wells and household wells provided less water per day than reported during the baseline survey. Only one household reported using a household spigot during the mid-term survey, and no households used a household spigot during the baseline survey. During the mid-term survey, the least amount of water, 88 L/day, was collected from the river. This volume was approximately half of the average volume collected during the baseline survey, but only one household reported the volume obtained from the river during the mid-term survey, compared to 18 households during the baseline survey.

Table 3.3.1.3 Daily Volume of Water Collected in Each Household by Water Source
El Salvador - Study Area 1 - Las Pozas, February 2001

Water Source	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=96	2001 N=102	2000	2001	2000	2001	2000	2001
Shared well	65	80	4- 968	0-418	154	133	88	105
Household well	9	17	62- 400	23-314	188	132	154	110
River	18	1	22- 455	88	179	88	132	88
Household spigot	-	1	-	130	-	130	-	130
Bottled water	-	1	-	1	-	1	-	1

Water Meter Data
Because the water distribution system and household taps had not been installed at the time of data collection, no water meters were installed to estimate household water usage. (Table 3.3.1.4 is omitted in this section).

Access to Water
The temporal aspect of access to water was measured as the length of time each day people had to wait to get water and if a water source provided water year-round. Sixty two percent (63/102) of households participating in the mid-term survey reported that they had to wait to get their water, at least some of the time. Of those who had to wait, 48% (30/63) said they had to wait for less than 15 minutes, 32% (20/63) had to wait between 15 minutes and a half hour, and 21% (13/63) had to wait for longer than a half hour. When compared to the baseline survey, the percentage of households reported that they had to wait to get water decreased. However, of those people who had to wait to get water, the time spent waiting for water increased slightly: 57% of participants in the baseline survey waited for less than 15 minutes and only 16% waited for more than a half hour during the baseline survey.

Nearly all participants in both the baseline and the mid-term survey reported having water all day long, and the percentage of households reporting that their primary water source provided water all year long increased from 66% (63/96) in the baseline survey to 92% (94/102) in the mid-term survey.

Home Water Use

The home water use variables, summarized in Table 3.3.1.5, include the frequency and sites where participants washed clothes and bathed. Households participating in the mid-term survey washed clothes an average of five times a week, an increase from the reported frequency during the baseline survey (four times a week). More households reported washing clothes at their home during the mid-term study (17%, (18/102) than during the baseline survey (9%, 9/97). Although most people participating in the mid-term survey (80% (82/102)) reported washing their clothes in the river, the percentage decreased from the baseline survey, in which 90% (87/97) of participants washed their clothes in the river. The percentage of households reporting that they bathed in the same place they washed clothing remained approximately the same in the mid-term survey as reported in the baseline survey. However, the percentage of respondents who reported bathing daily increased from 76% (73/97) during the baseline survey to 96% (98/102) during the mid-term survey.

Table 3.3.1.5 Summary of Household Water Use
El Salvador - Study Area 1 - Las Pozas, February 2001

Home Water Use	Baseline Survey 2000	**Mid-term Survey 2001**
Wash clothes (average)	4 times/week	**5 times/week**
Wash clothes at home	9% (9/97)	**17% (18/102)**
Wash clothes at a neighbor's house	1% (1/97)	**1% (1/102)**
Wash clothes in a river/creek	90% (87/97)	**80% (82/102)**
Bathe where they wash clothes	79% (76/96)	**82% (84/102)**
Bathe daily	76% (73/97)	**96% (98/102)**
Bathe at other frequency	11% (11/97)	**4% (4/102)**

Percentage of child caregivers and food preparers with appropriate hand washing behavior

The assessment of appropriate hand washing knowledge and behavior was based on the interviewees' ability to recite critical times at which they wash their hands and to demonstrate good hand washing technique. Proper hand washing is one of the most effective ways to break the fecal-oral route of disease transmission. Hand washing knowledge was self-reported and behaviors were observed and scored by the interviewer. A passing score was eight or more correct responses out of ten (8/10) (Billig, et al., 1999). Unanswered questions were considered a "no" response. The ARC interventions include a health education component that should increase the knowledge and practice of proper hand washing. Hands washing knowledge and behavior of the primary child caregiver and food preparer are shown in Tables 3.3.1.6 and 3.3.1.7.

Primary Child Caregiver

Comparison of the mid-term and baseline surveys shows that there was an increase in the number of passing scores of 8/10 or greater: 20% (19/97) in the baseline survey versus 28% (14/50) in the mid-term survey. Hand washing was reported most frequently during the baseline survey before eating and before cooking, and during the mid-term survey before cooking and before eating and after defecating. Hand washing was least reported before cleaning children's bottoms in both surveys (only 12% in the baseline survey and 8% in the mid-term survey). Results for hand washing behavior improved from the baseline survey to the mid-term survey. More of the primary child caregivers used soap and water to wash their hands and either dried their hands on a towel or air-dried them during the mid-term than the baseline survey.

Table 3.3.1.6 Primary Child Caregiver Hand Washing Knowledge and Behavior
El Salvador - Study Area 1 - Las Pozas, February 2001

Primary Child Caregiver		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	74% (70/95)	**64% (32/50)**
	Before cooking	61% (58/95)	**74% (37/50)**
	Before feeding children	31% (29/94)	**24% (12/50)**
	After defecating	56% (53/95)	**64% (32/50)**
	After cleaning children's bottom	12% (11/94)	**8% (4/50)**
How do you wash your	Use water	97% (89/92)	**100% (48/48)**
	Use soap	78% (72/92)	**83% (40/48)**

hands? (behavior)	Use both hands	83% (76/92)	**98% (47/48)**
	Rub hands. 3 times	82% (75/92)	**94% (45/48)**
	Dry hands on towel or air dry	39% (36/92)	**60% (29/48)**
Total passing score (8 of 10)		20% (19/93)	**28% (14/50)**

≥ greater than or equal to

Household Food Preparer

A comparison of the mid-term and baseline surveys shows that there was a slight increase in the number of primary food preparers who received passing scores of 8/10 or greater on the hand washing test: 20% (19/93) in the baseline survey to 21% (21/102) in the mid-term survey. During the baseline survey, hand washing was reported most frequently before eating and before cooking, and before cooking and after defecating during the mid-term survey. Results for hand washing behavior improved from the baseline survey to the mid-term survey. More of the primary food preparers used soap and water to wash their hands and either dried their hands on a towel or air-dried them during the mid-term survey than the baseline survey.

Table 3.3.1.7 Household Food Preparer Hand Washing Knowledge and Behavior
El Salvador - Study Area 1 - Las Pozas, February 2001

Household Food Preparer		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	74% (72/97)	**61% (60/102)**
	Before cooking	62% (60/97)	**77% (78/102)**
	Before feeding children	30%(29/96)	**17% (17/102)**
	After defecating	56% (54/97)	**70% (71/102)**
	After cleaning children's bottom	12% (11/96)	**4% (4/102)**
How do you wash your hands? (behavior)	Use water	97% (91/94)	**100% (98/98)**
	Use soap	78% (73/94)	**81% (79/98)**
	Use both hands	83% (78/94)	**98% (96/98)**
	Rub hands 3 times	82% (77/94)	**93% (91/98)**
	Dry hands on towel or air dry	38% (36/94)	**58% (57/98)**
Total passing score (8 of 10)		20% (19/97)	**21% (21/102)**

≥ greater than or equal to

People living in households where there are no children will be less likely to report hand washing activity before or after interaction with children. However, no differences in scoring were made to account for the fact that people who do not live with young children would be less likely to think of these answers than those living with young children. Therefore, the overall hand washing scores of primary child caregivers and food preparers in households with children less than three years of age and households with no children less than three were compared. A higher percentage of people received passing scores in households where there were children: in the households with children 30% (12/40) of the childcare givers and 30% (12/40) of the food preparers received a passing score, whereas only 3% (2/62) of the child caregivers and 15% (9/62) of the food preparers received a passing score in the households with no children.

Hand Washing Education

The Red Cross conducted a majority of the health education workshops (charlas) focusing on hand washing behavior that were reported by the study participants in the mid-term survey. In the baseline survey health promoters from the Ministry of Health or CARE-CALMA gave the majority of the charlas. The same percentage (84% (84/102)) of households reported receiving a charla on proper hand washing behavior during the mid-term and baseline surveys (Figure 3.3.1.2).

Most of the people that received a charla on hand washing skills did not pass the hand washing test. Of the child caregivers, 85% (73/86) of those who received a charla did not receive a passing score. However, people who received a charla had higher scores than those that did not receive a charla. Fifteen percent (13/86) of the child caregivers who had a charla received a passing score, compared to 6% (1/16) of those who not have a charla. This is the opposite of the results of the baseline survey, in which a higher percentage of child caregivers who had not received a charla had passing scores than those that had a charla: 27% vs. 13%.

Of the food preparers, 77% (66/86) of those who received a charla did not receive a passing score. However, 23% (20/86) of the food preparers who received a charla did get a passing

score, compared to 6% (1/16) of those who did not have a charla. Like the results seen for the child caregivers, during the baseline survey a higher percentage of child caregivers who had not received a charla received passing scores than those that had a charla: 27% vs. 13%.

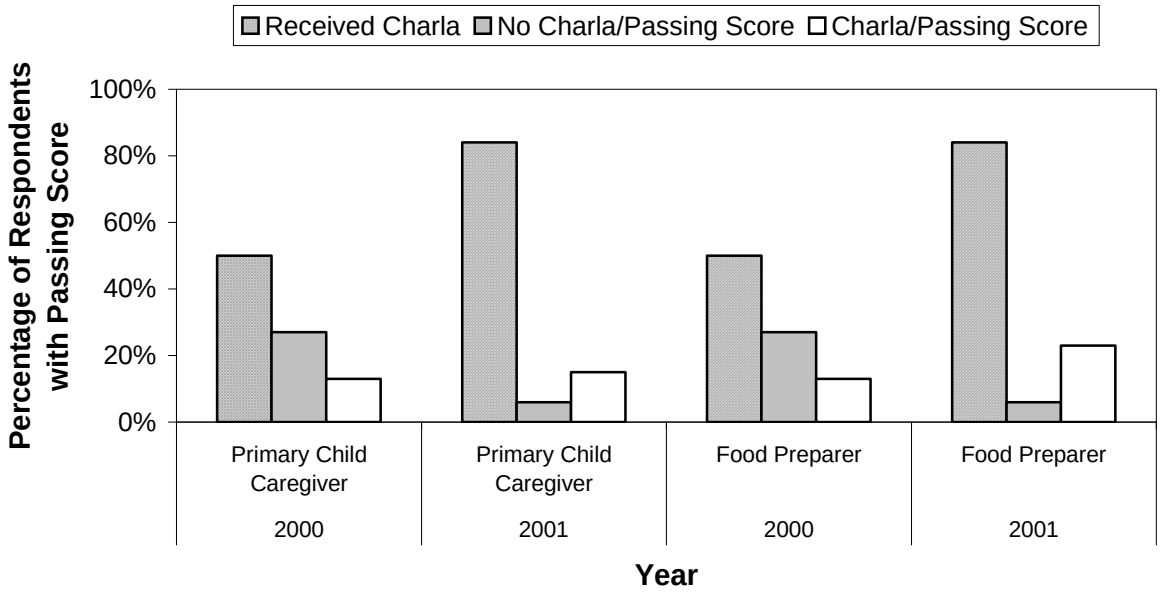

Figure 3.3.1.2 Comparison of Health Education and Hand Washing Scores
El Salvador – Study Area 1 - Las Pozas, February 2001

Percentage of population using hygienic sanitation facilities

Proper disposal of excreta is essential to protect the health of the community members, particularly children. This indicator focuses on the percentage of the population that used hygienic sanitation facilities, where a sanitation facility is defined as a functioning toilet or latrine where excreta are disposed. This indicator was met if the facility was hygienic and used by household members greater than 12 months of age.

A facility was considered hygienic if there were less than three flies present and no excreta were found outside the latrine. It was considered in use if the latrine had one or more of the following conditions: it had been recently cleaned with water, there was a path to the latrine, there were signs of recently being swept, there were signs of recent repair, and there were no spider webs.

Use of Hygienic Facilities

Table 3.3.1.8 is a summary of the characteristics of the sanitation facilities. The number of people using a latrine increased during the mid-term survey compared to the baseline survey. Additionally, the number of hygienic latrines that were in use and the number of people who were using hygienic facilities increased. More of the study participants disposed of a baby's waste in a latrine during the mid-term survey than during the baseline survey and less people disposed of waste in places other than a latrine. However, hand washing areas, on average, were located slightly farther from latrines during the mid-term survey (21 m) than during the baseline survey (13 m).

Table 3.3.1.8 Sanitation Facility-Use and Practice
El Salvador – Study Area 1 - Las Pozas, February 2001

Sanitation Facilities	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Total population >12 months of age using a latrine	50% (174/346)	**92% (374/408)**
Latrines that are hygienic and in use *	70% (35/50)	**80% (79/99)**
Population > 12 months of age using a hygienic latrine	34%(119/346)	**74% (303/408)**
Dispose of baby's** waste in a latrine	45% (21/47)	**82% (23/28)**
Dispose of baby's waste not in a latrine	55% (26/47)	**18% (5/28)**
Mean distance to hand washing area	13 m	**21 m**

* Hygienic is <3 flies present and no excreta are found outside the latrine. In Use if household members are reported to use the latrine and the latrine has one or more of the following, recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
** baby defined as a child less than 12 months of age
>greater than

Education on Care and Use of Latrines

The study participants reported that the Health Committee conducted the highest percentage of the health education workshops (charlas) on use and care of latrines with the Red Cross conducting the most in collaboration with other groups. The mid-term survey showed that 94% (96/102) of households had received a charla on the care and use of latrines, an increase from the baseline survey in which only 51% (48/95) reported that they had received a charla on the use and care of latrines and the majority of the charlas reported during the baseline study were given by health promoters from the Ministry of Health or CARE-CALMA.

Of the households that had access to sanitary facilities, the people that had received a charla on the care and use of latrines had more sanitary latrines than those that didn't receive a charla: 87% (80/92) of those who received a charla had a hygienic sanitary facility compared to 33% (2/6) who did not receive a charla (Figure 3.3.1.3). This is an improvement from the baseline survey, in which a higher percentage of households that did not receive a charla had hygienic sanitary facilities (78%) than those who had received a charla (67%).

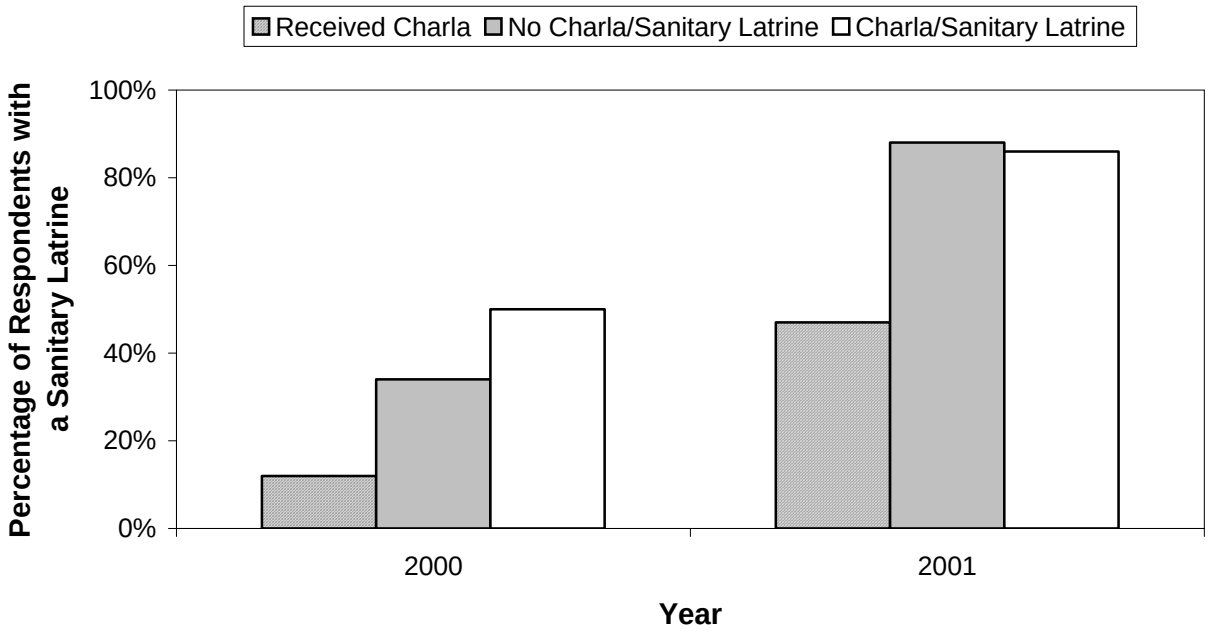

Figure 3.3.1.3 Comparison of Health Education and Sanitary Latrines
El Salvador – Study Area 1 – Las Pozas, February 2001

Monitoring Indicators

Percentage of households with year-round access to improved water source
This indicator is a measure of the homes that are directly connected to a piped system or that have an adequate public private or shared water source that is located within 200 meters of the home, and is used for drinking, cooking, cleaning, and bathing. No particular level of water quality is implied. Water sources defined as "adequate" may include protected wells and springs, but do not include untreated surface waters.

In Las Pozas, water sources defined as adequate included household and community wells. During the mid-term survey, 60% (61/102) of participating households reported year-round access to an improved water source that was located within 200 m of the house. This increased from the baseline survey, in which 38% (37/98) of households reported using an improved water source within 200 m of the house. The average distance to an improved water source decreased from 276 m during the baseline survey to 190 m during the mid-term survey. The percentage of households within 200 meters of the water source increased from 66% (65/98) in the baseline survey to 69% (70/102) in the mid-term survey. There was an increase in the percentage of households that had access to year round water from 66% (63/96) in the baseline study to 92% (94/102) in the mid-term survey, and the percentage of households with access to a protected water source from increased from 79% (76/96) in the baseline survey to 99% (101/102) in the mid-term survey.

Prior to Hurricane Mitch, households reported traveling an average of 98 m to get water (median 10, and range of 0 to 1000 meters). After Hurricane Mitch, at the time of the baseline survey, households reported traveling an average of 301 m to get water (median=150, range with a range

of 0-3000 m). During the mid-term survey, the average distance households traveled to get to their water source decreased to 216 m (range from 2 m to greater than 4000 m, and median distance of 150 m).

Interviewer estimates of distance from the interviewed household to its water source were very similar to estimates of the interviewees and were highly correlated (Pearson's correlation coefficient 0.84). As shown in Table 3.3.1.9, at the time of the mid-term survey the volume of water collected appeared to have an association with the distance from the household to the water source. The greatest volume of water was collected by those traveling the shortest distance: 155 liters per day from water sources less than or equal to 10 m from the household. The amount of water collected per day decreased as the distance from the household to the water source increased. The lowest volume of water collected, 76 L, was collected per day by those traveling the farthest distance, greater than or equal to 999 m. This trend was not seen in the data from the baseline survey, in which similar volumes of water were reported collected from the sources closest to the households and those farthest away.

Table 3.3.1.9 Daily Volume of Water Collected in Relation to Distance from Household to Water Source
El Salvador - Study Area 1 - Las Pozas, February 2001

Distance (meters)	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=93	**2001 N=100**	2000	**2001**	2000	**2001**	2000	**2001**
≤10	10	**12**	22-400	**23-314**	188	**155**	214	**143**
11-50	8	**15**	22-968	**38-352**	179	**151**	77	**110**
51-100	21	**17**	22-330	**1-330**	121	**134**	88	**110**
101-200	24	**24**	4-792	**22-418**	193	**119**	143	**110**
201-500	18	**30**	8-682	**0-381**	133	**120**	88	**88**
501-998	6	-	44-455	-	163	-	77	-
≥999	6	**2**	77-330	**22-130**	188	**76**	176	**76**

≤ less than or equal to
≥ greater than or equal to

Percentage of households with access to a sanitation facility

A household was considered to have access to a sanitation facility if that household had a private facility or shared a facility with others in a community. During the mid-term survey, all of households reported having access to a sanitation facility, compared to only 55% (53/97) during the baseline survey (Table 3.3.1.10). Additionally, the percentage of private sanitation facilities increased from 83% (44/53) during the baseline survey to 99% (100/101) during the mid-term survey. Finally, the type of household latrines changed from 98% (49/50) dry pit latrines and 2% (1/50) composting latrines in the baseline survey to 7% (7/101) dry pit latrines and 92% (93/101) composting latrines in the mid-term survey (Table 3.3.1.10).

Table 3.3.1.10 Household Access and Description of Sanitation Facilities
El Salvador - Study Area 1 - Las Pozas, February 2001

Sanitation Facility	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Access to a latrine	55% (53/97)	**100% (102/102)**
Number of latrines inspected	100% (53/53)	**99% (101/102)**
Private facility	83% (44/53)	**99% (100/101)**
Shared facility	17% (9/53)	**1% (1/101)**
Dry pit latrines	98% (49/50)	**7% (7/101)**
Composting latrines	2% (1/50)	**92% (93/101)**

Percentage of recurrent costs for water supply services provided by the community served

This indicator cannot be assessed until the water supply interventions are completed.

Percentage of constructed water supply systems operated and maintained by the communities served

This indicator cannot be assessed until the water supply systems are completed in all study areas.

Water Quality Testing

The results of the analyses of the community waster source and household water samples are summarized in Table 3.3.1.11. All water samples were analyzed using the portable DelAgua Water Testing Kit. However, there were difficulties reading the results from the DelAgua Water Testing Kit, which are thought to be due to the high ambient temperature, which may have dried out some of the samples. Total coliforms and *E. coli* were quantified and reported as CFU/100 ml of water. A subset of samples was analyzed in duplicate using the Deluge kit, and a subset of samples was analyzed by a qualitative test using the PurTest kit to confirm the presence or absence of total coliforms and *E.coli*. A sterile water blank was analyzed with each batch of samples to verify that sterile conditions were being maintained.

During the baseline survey, all samples from the community water sources and household water samples were contaminated with total coliforms and *E. coli.* During the mid-term survey, there was a reduction in the number of contaminated community and household water samples.

Table 3.3.1.11 Community and Household Water Sources Receiving Treatment and Coliform Results
El Salvador - Study Area 1 - Las Pozas, February 2001

Water Tested	Sample Size (N)		Water Treated		Percent of Samples Positive for Total coliforms		Percent of Samples Positive for *E. coli*	
	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
Community source	4	**4**	0% (0/4)	**0% (0/4)**	100% (4/4)	**100% (4/4)**	100% (4/4)	**50% (2/4)**
Household samples	15	**10**	13% (2/15)	**20% (2/10)**	100% (15/15)	**80% (8/10)**	100% (15/15)	**60% (6/10)**

Community Water Source

The community uses a system of shared wells as their primary water source. The water samples from all four wells were contaminated with total coliforms (100%, 4/4), and 50% (2/4) were contaminated with *E.coli*. The results of the quantitative analysis using the Deluge Water Testing kit for total coliform bacteria ranged from 5 CFU/100 ml to too numerous to count (TNTC) and from 6 CFU/100 ml to TNTC for E*.coli.* All community water samples were also contaminated with total coliforms during the baseline survey. However, the percentage of community water samples contaminated with *E.coli* decreased from 100% (4/4) during the baseline survey to 50% (2/4) in the mid-term survey. Some of the wells may have been treated with chlorine prior to the mid-term survey, but this was not possible to verify.

Household Water Samples

During the mid-term survey, water samples were taken from water stored in 10 households for drinking. As shown in Table 3.3.1.11, 80% (8/10) of the samples were contaminated with total coliforms and 60 % (6/10) were contaminated with *E.coli*, compared to the baseline survey, in which 100% (15/15) of samples were contaminated with total coliforms and *E. coli.* Quantitative results of household water samples testing positive during the mid-term survey ranged from 6 to 80 CFU/100 ml for total coliform bacteria and 8 to 24 CFU/100 ml for E*.coli.*

Twenty percent (20/10) of the households that provided a water sample reported treating their water on the day of the interview. There was no association between treating water on the day of the interview and having uncontaminated water. The water sampled from both of the households that reported treating their water was contaminated with total coliforms, and one of two was contaminated with *E. coli.* Of the eight water samples that were taken at households that reported that they did not treat their water on the day of the survey, 75% (6/8) were contaminated with total coliforms and 63% (5/8) were contaminated with *E.coli*.

Quality Assurance

The results from the duplicate analysis of a water sample taken from the source water using the Deluge kit were not readable. No bacteria grew in the sterile water blanks analyzed, indicating that sterile conditions were adequately maintained during processing of the water samples.

The results of the duplicate analyses run using PurTest kit were generally in agreement with the results found using the DelAgua kit. Four of four total coliforms tests agreed, testing positive for total coliform bacteria using both methods. Three of four *E. coli* tests agreed: all samples tested positive for *E. coli* using the PurTest kit whereas only three tested positive for *E. coli* using the DelAgua kit.

Storage, Handling and Treatment

A summary of the way water is stored, handled and treated in the home is shown in Table 3.3.1.12. Handling of household water improved between the baseline and the mid-term surveys. The percentage of households who reported storing water remained about the same during the baseline and mid-term surveys, and the percentage of households that stored drinking water decreased slightly from 96% (92/96) to 90% (92/102). However, the percentage of households that covered their stored drinking water increased from 72% (64/89) during the baseline survey

to 96% (88/92) during the mid-term survey, and the percentage of households serving water by pouring it increased from 49% (45/92) to 68% (65/93) during the same time period. The increase in households that poured water was due to a decrease in households that served water by dipping a cup into the water container from 48% (44/92) to 28% (26/93) from the baseline to the midterm survey.

The percentage of households that treated their drinking water on the day of the survey increased from 25% (24/97) in the baseline study to 45% (45/100) in the mid-term survey. Additionally, the percentage of households reporting that they treated their water at least sometimes increased from 55% (53/96) in the baseline survey to 71% (72/101) in the mid-term survey. Finally, the percentage of households that treated drinking water with chlorine increased in the mid-term survey when compared to the baseline survey.

Table 3.3.1.12 Summary of Water Storage, Handling and Treatment
El Salvador – Study Area 1 – Las Pozas, February 2001

Technique	Baseline Survey 2000	**Mid-term Survey 2001**
Storage and Handling		
Store water at home	93% (90/97)	**92% (94/102)**
Stored drinking water	96% (92/96)	**90% (92/102)**
Covered drinking water	72% (64/89)	**96% (88/92)**
Dip in a cup for water	48% (44/92)	**28% (26/93)**
Pour water into a cup/glass	49% (45/92)	**68% (65/93)**
Treatment		
Treated water day of survey	25% (24/97)	**45% (45/100)**
Always treated water	20% (19/96)	**51% (52/101)**
Sometimes treated water	35% (34/96)	**20% (20/101)**
Never treated their water	45% (43/96)	**29% (29/101)**
Treat water with chlorine	82% (47/57)	**92% (66/72)**
Treat water by boiling	4 % (2/57)	**1% (1/72)**
Other methods of treatment	12% (7/57)	**7% (5/72)**

Water Treatment Education

The Ministry of Health with the Red Cross health promoters conducted a majority of the health education workshops (charlas) focusing on proper storage and treatment of water reported by the study participants in the mid-term survey, whereas the Ministry of Health or CARE-CALMA conducted the majority of reported charlas during the baseline survey. The mid-term survey showed that 88% (90/102) of households reported receiving a charla on how to treat household water, compared to the baseline survey, in which 53% (50/96) of the households had received such charlas.

In order to determine if the charlas on how to treat and care for household water affected behavior, the reported actions of participants who had received a charla were compared to those of the participants who had not received a charla (Figure 3.3.1.4). A higher percentage of households that had a charla covered their drinking water, 98%, vs. 82% of those who had not received a charla. However, a higher percentage of households that had not had a charla poured

their water than those who had received a charla, whereas a higher percentage of households that had received a charla served the water by dipping a cup into it.

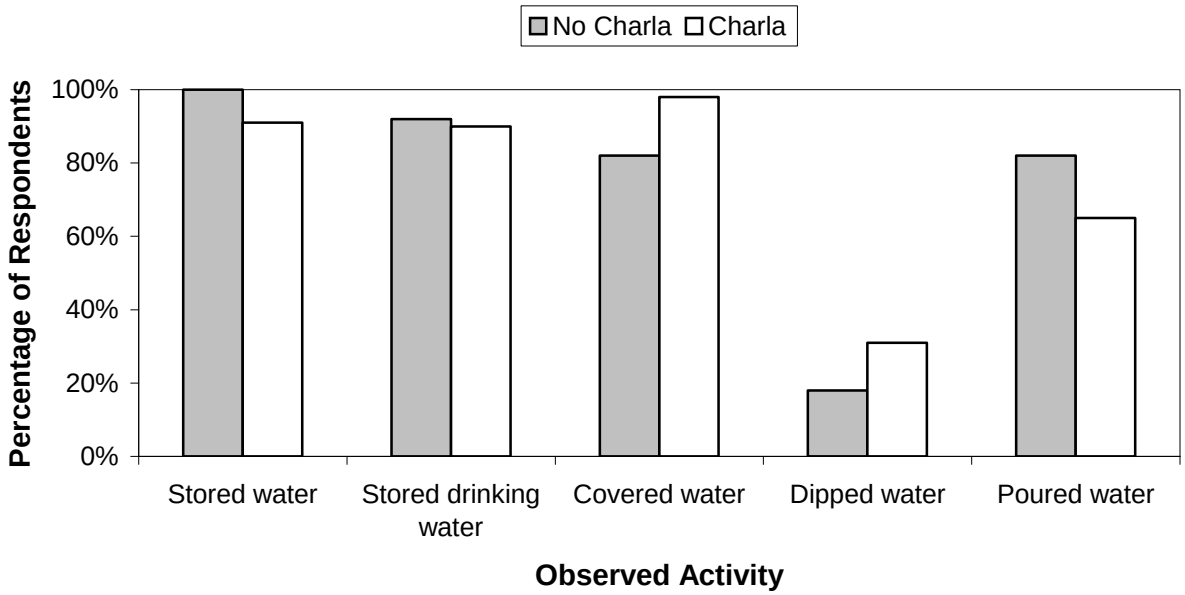

Figure 3.3.1.4 Water Storage Activities Observed by Interviewer in Relation to Receiving a Charla on Proper Storage and Handling of Water
El Salvador – Study Area 1 – Las Pozas, February 2001

The behaviors of participants in households that received a charla on the treatment of water and those who did not receive a charla on this subject were different (Figure 3.3.1.5). An equal percentage (45%) reported treating their water on the day of the survey. A higher percentage of households that had received a charla reported they treat their water at least sometimes: 74% vs. 50%. Also, a higher percentage of households that had received a charla reported treating their water with chlorine than those who had not received a charla, 92% vs. 83%, respectively. And a lower percentage of households that received a charla reported boiling their water (0% vs. 17%).

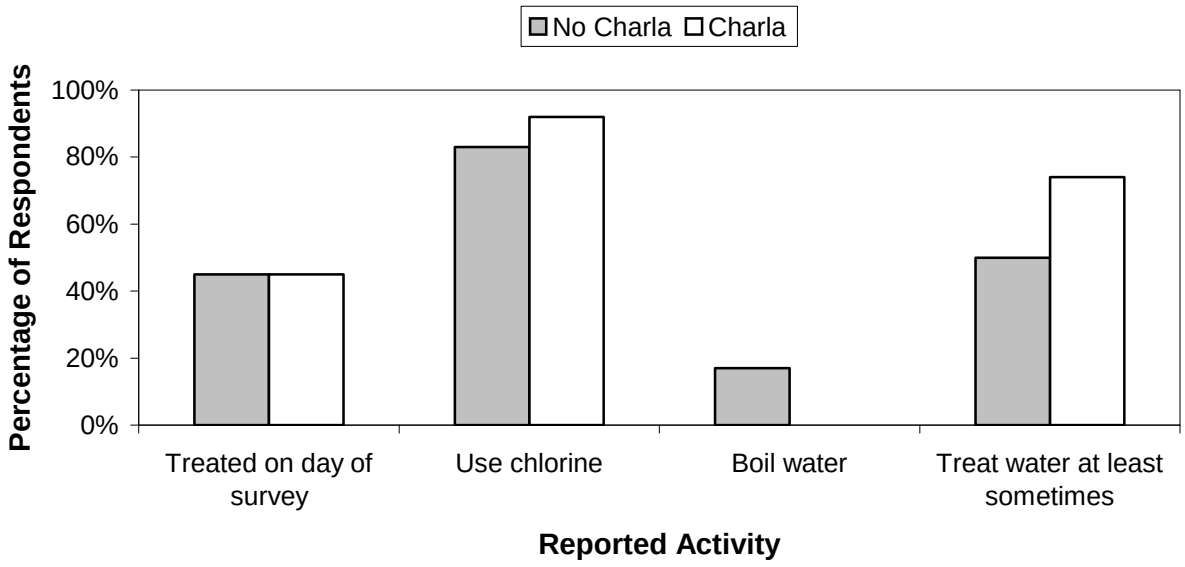

Figure 3.3.1.5 Water Treatment Activities Reported by Study Participants in Relation to Receiving a Charla on Proper Treatment of Water
El Salvador – Study Area 1 – Las Pozas, February 2001

Discussion

The water, sanitation, and education interventions were started in Las Pozas at the time of the mid-term survey, but were at differing stages of completion. The water system was close to completion, the latrines were constructed but had received some damage during the earthquakes that occurred in January and February 2001, and the hygiene and sanitation education was 90% complete. Other agencies besides the Red Cross were also involved in providing health education to the community.

The baseline and mid-term survey USAID Performance Indicators in Las Pozas are summarized in Table 3.3.1.13. Comparison of these data shows that the interventions are improving the health of the community and their access to and use of water and sanitation facilities. It should be recognized that the interventions are in progress and the final survey in February 2002 will clearly define the impact of the interventions on this community. Although none of the five impact indicators were met, progress was made toward the final goal for three of the five impact indicators, Likewise, the final goal for one of the monitoring indicators had been met at the time of the mid-term survey, and progress was made toward meeting the final goal for the other monitoring indicator.

Table 3.1.1.13 Performance Indicators
El Salvador - Study Area 1 - Las Pozas, February 2001

Performance Indicator	USAID Guideline	Status During Baseline Survey (2000)	Final Goal (2002)	Status During Mid-term Survey (2001)	Percent Difference: Baseline to Mid-term[1]	Progress To Goal: Baseline to Mid-term[2]	Status Relative to Final Goal[3]

Impact Indicator							
Children under <36 months with diarrhea in the last 2 weeks[4]	25% decrease	40 (19/47)	≤30	46 (22/48)	15% increase	NA	0%
Quantity of water used per capita per day	100% using 50 Lpd	21% (21/98)	100%	17% (17/102)	NA	4% decrease	17%
Child caregiver with appropriate hand washing behavior	50% increase	20% (19/93)	≥30%	28% (14/50)	40% increase	NA	80%
Food preparers with appropriate hand washing behavior	50% increase	20% (19/97)	≥30%	21% (21/102)	5% increase	NA	10%
Population using hygienic sanitation facilities[5]	75% usage	34% (119/346)	≥75%	74% (303/408)	NA	40% increase	99%
Monitoring Indicator							
Households with year-round access to water[6]	NE	38% (37/98)	100%[7]	60% (61/102)	NA	22% increase	60%
Households with access to a sanitation facility	NE	50% (47/95)	100%[7]	100% (102/102)	NA	50% increase	100%

1 Calculated ONLY for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values
2 Calculated ONLY for indicators with goals with an absolute goal (e.g., 100%) by subtracting the baseline value from the mid-term value
3 Status with respect to the final goal for each indicator, calculated for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values divided by the goal, calculated for those with an absolute goal (e.g., 100%) by dividing the mid-term value by the goal; >100% indicates that the goal was exceeded
4 Goal is a reduction in the number of cases of diarrhea per 100 children in the study population.
5 A facility is considered hygienic if there are less than 3 flies present and no excreta are found outside the latrine. A latrine is IN USE if latrine it has one or more of the following conditions: recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
6 Water source is less than 200 meters away from the household and there is access to water year-round.
7 Goal was established by the American Red Cross
NE none established

Impact Indicators

The period prevalence of diarrhea in children less than 36 months of age increased slightly from 40 per 100 children to 46 per 100 children from the baseline to the mid-term survey. Diarrhea is usually associated with diet, breastfeeding status, access to water, quality of water, hand washing practices, and access to sanitary facilities. Although many of these factors improved, diarrhea prevalence increased, suggesting that the increased diarrhea rate between the two years may be

due to an increase in risk factors that were not measured in the household survey. The percentage of children breast-feeding increased from 40% to 55%. Access to an improved water source also increased between the two years as households changed their primary water source from the river to shared wells, and households reported using more water. Additionally, the percentage of child caregivers using appropriate hand washing behavior increased from the baseline to the mid-term survey. Finally, there was an increase in the percentage of households reporting treating their drinking water from 9% to 65% during the baseline and mid-term surveys, respectively. The factors existing in Las Pozas at the time of the mid-term survey: improved access to improved water, increased hygienic practices for hand washing, increased treatment of water, and increased number of children breast-feeding are usually associated with a decrease in diarrheal rates.

The average per capita daily water use increased from 43 L/p/d to 131 L/p/d. This is a greater than 300% increase in the average water quantity used daily per person. However, there was a 19% decrease in the percentage of households that had access to the USAID guideline of 50 L water/p/d, from 21% (21/98) to 17% (17/102). However, progress was made toward the goal of 100% of the households having access to 50 L/p/d. The percentage of households getting their water from protected water sources increased, and fewer households had to wait to get water. However, those who had to wait to get water waited longer than they did during the baseline survey. This is not surprising because more households used water a shared well during the mid-term survey instead of the river. The increase in access to water coincided with improvements in the storage, handling and treatment of the household water in the mid-term survey

Hand washing behaviors of child caregivers and food preparers improved between the baseline survey and the mid-term survey. There was an increase in the percentage of child caregivers with appropriate hand washing behavior from 20% (19/93) to 28% (14/50). This increase of 40% in the percentage of child caregivers with appropriate hand washing behavior nearly met the goal for the final survey of a 50% increase over the percentage with appropriate hand washing behavior in the baseline survey. The health education classes in the community likely contributed to the improvement in appropriate hand washing behavior. The percentage of food preparers with appropriate hand washing behavior increased only slightly, from 20% (19/97) to 21% (21/102). The same percentage of households reported receiving health education on appropriate hand washing techniques during the baseline and mid-tern surveys, but more of the health education in the mid-term study was reported to be from the American Red Cross, the Salvadorian Red Cross, or another national chapter.

The percentage of the population that used hygienic facilities doubled from 34% (119/346) during the baseline survey to 74% (303/408) during the mid-term survey, and nearly met the final goal of 75% of the population using hygienic latrines. The increase in access to hygienic latrines can be attributed to fact that the latrine project in the community was nearly completed at the time of the mid-term survey.

Monitoring Indicators

The percentage of households with year-round access to improved water increased from 38% (37/98) during the baseline survey to 60% (61/102) during the midterm survey. This increase is especially impressive because of the setbacks to the water project caused by the earthquakes that

occurred in January and February, just prior to the mid-term survey. Two factors that are necessary for a year-round water source to be considered improved are that the source is protected source and is located within 200 m of the household. Access to a protected water source increased from 79% during the baseline survey to 99% during the mid-term survey. The percentage of households with year-round access to water from their primary water source also increased from 66% to 92%. Finally, there was an increase in the households that were within 200 meters of the water source, from 66% during the baseline survey to 69% during the mid-term survey. All of these improvements to access to a protected water source were made even though the water intervention was not completely installed and operational.

The percentage of households with access to sanitation facility increased from 50% (47/95) in the baseline survey to 100% (102/102) in the mid-term survey, at which time the ARC latrine intervention was nearly complete. The percentage of private latrines also increased from 83% to 99%, and the type of latrines that people had access to changed from 98% dry pit latrines to 92% composting latrines and only 7% dry pit latrines.

Water Quality Analysis

Water quality testing revealed a decrease in contamination in the community and household water samples from the baseline to the mid-term survey. During the mid-term survey, all of the water samples from the community sources were contaminated with total coliforms and 50% were contaminated with *E.coli,* compared to all of the community water sources being contaminated with both total coliforms and *E. coli* at the time of the baseline survey. Eighty percent of the household water samples taken during the mid-term survey were contaminated with total coliforms and 60% with *E.coli*, compared to the baseline survey, when all of the household samples were contaminated with both total coliform bacteria and *E. coli*. There was no direct association of these decreases in contamination with the treatment of the water on the day of the sampling. However, there were improvements in the storage, handling and treatment of water, with more people serving water by pouring it and not by dipping a cup into the water storage container, more people reporting treating their water, and more people covering their drinking water.

Recommendations

The mid-term survey revealed progress towards the final goal in most of the impact and monitoring indicators. The CDC recommends that the ARC continue the planned interventions for Las Pozas.

Water

The CDC recommends the ARC continue close communications with CARE while CARE completes the planned water intervention for Las Pozas, which would provide each household with its own household spigot. Health education classes should be continued to emphasize the importance of the proper care and treatment of household water.

Sanitation

CDC recommends the ARC complete the sanitary intervention in Las Pozas, so that each household has its own composting latrine. Special attention should be paid to constructing the

latrines so that they are safe from future earthquake damage. The distance between the latrine and the hand washing area, which increased between the baseline and the mid-term survey, should be reduced. Health education classes should emphasize the proper use and care of household latrines.

Hand Washing Behavior

CDC recommends the ARC continue the health education classes in Las Pozas on appropriate hand washing to convey the message of proper hand washing methods and to stress the importance of the hand washing in improving health.

Water Quality Testing

CDC recommends the ARC verify the quality of the water sources in Las Pozas, establish a systematic water testing system, and create a water treatment program for the community water sources. A protocol about how to maintain the quality of water in the community water sources should be developed. The water committee should receive proper training to maintain all aspects of the water project once the water project is completed

Study Area 2 - La Ceiba

The baseline study was conducted in La Ceiba on February 4, 2000 with a team of seven interviewers, the ARC in-country water and sanitation delegate, and one CDC investigator. There was a population of 600 inhabitants with 100 houses. However, many of these houses were not permanently occupied. A census was taken of all of the inhabited houses and 73 interviews were conducted. There was close to universal participation of the study with 96% (73/76) of the households contacted agreeing to participate.

Due to two major earthquakes experienced in El Salvador in 2001, on January 13 and on February 13th, the ARC in-country water and sanitation delegate and the volunteers from the El Salvadorean Red Cross were not able to participate in the data collection aspect of the mid-term study. The health delegate from the El Salvadorean Red Cross participated in the data collection process supported by the ARC in-country water and sanitation delegate from Guatemala and the staff of the Guatemalan Red Cross. A team of eight interviewers including the health delegate, the ARC in-country water and sanitation delegate from Guatemala, and one CDC investigator traveled by car to La Ceiba from San Miguel on February 14, 2001 to conduct the data collection.

In the mid-term study as in the baseline study, there was a population of La Ceiba was 600 inhabitants with 100 houses. As in the first year of the evaluation, not all of the houses in the community were permanently occupied. Because of the recent earthquakes, slightly more houses were unoccupied at the time of the mid-term survey than at the time of the baseline survey. All of the houses with inhabitants were approached to participate in the study and 63 interviews were conducted. Upon arrival to the town, each interviewer was assigned to a different section of the town in which to conduct the interviews and was escorted by a member of the local health brigade in locating the houses. The CDC investigator collected a total of 16 water samples: 11 from households and 5 from community sources. There was almost universal participation in the study again with 98% (63/64) of the households contacted agreeing to participate. Two-thirds (40/62) of the households reported having participated in the study the previous year.

Community Description

La Ceiba is a rural village in a mountainous region of El Salvador. Most of the homes are small farms, which are isolated and most are not visible from the central plaza. The center of town has a school, a soccer field, a church, a small shop, and a workshop from which much of the new community construction is taking place. The people in La Ceiba were affected by Hurricane Mitch and are working to rebuild their community. Most of the people currently living in La Ceiba are originally from La Ceiba or from other villages in the same mountainous region. The primary occupation is agriculture. The majority of the population has a third grade education. The principle needs of the community at the time of the mid-term survey were viewed by the community leaders as being the construction of better roads in the town and assistance in responding to the damage caused from the more recent earthquakes. The local ARC water and sanitation delegate interviewed the president of the water committee to obtain background information about the community.

Demographic Information

The mean household size during the mid-term survey was 5.8 people per household, which is the same as the household size in the baseline survey. On average, 0.3 children less than 36 months of age lived in each house, which is slightly less than the 0.6 children reported in the baseline survey. There was a shift from the baseline study to the mid-term study in people who live in their own homes. In the baseline study, 79% (56/71) reported living in their own home, 17% (12/71) living in temporary homes, and 2% (3/71) living with friends or family. In the mid-term survey 95% (60/63) reported living in their own home, 1.6% (1/63) living with friends or family, 2% (1/63) living in a temporary house, and 2% (1/63) living in a rented house.

Education

The interviewees' level of education was reported from zero to nine years of formal education. There was a slight decrease in the educational level of the participants from the baseline to the mid-term survey. The mean educational level reported in the mid-term survey was 1.1 years, which was two years lower than in the baseline survey. A higher percentage of people in the mid-term survey reported no formal education than in the baseline: 68% (43/63) vs. 64% (45/70). In the mid-term survey, 2% (1/63) of interviewees had completed at least six years of education. In the baseline survey, 7% (5/70) of the study participants had at least six years of education.

Status of Interventions

The interventions planned by the ARC were community-specific and based on existing resources and needs. Table 3.3.2.1 summarizes the perceived community need before the intervention (i.e., February 2000) and the intervention planned by the ARC. Additionally, this table lists the status of each intervention at the time of the mid-term survey.

At the time of the mid-term survey, the construction of water and sanitation system had been started and was close to completion. The community water system will be a spring fed system that fills a central holding tank by gravity and then is pumped to a distribution tank from where it will be gravity fed to individual household spigots. Each household will pay a minimal fee to receive water. Completion of the water project is scheduled for April 2001. As of February 2001, the wet well was built, but the distribution tank had not been completed and the distribution system to the individual houses was not completed. However, people could access water at the wet well using a spigot. The water committee was in place by November 2000.

The ARC is building composting latrines for each registered household. At the time of the mid-term survey, it was 40% complete and was scheduled for completion by March 1, 2001. There was also a health education campaign directed at housewives to promote the use and care of latrines, hygiene, and water care and use which had been occurring once a week for the six months prior to the mid-term survey. The hygiene education committee was in place by November 2000.

Table 3.3.2.1. Community Needs, Planned Interventions and Status of Interventions
El Salvador- Study Area 2 – La Ceiba, February 2001

Country/ Study Area	Perceived Community Need	Planned Intervention	Status of Intervention as of February 2001
El Salvador- La Ceiba	Water and better roads	• New water system ♦Household latrines + Education program- hygiene, water use and sanitation	• Community tap completed, water tanks completed-some damage due to earthquake; water distribution system planned but not started; water and health committees established ♦Latrine construction 80% complete + Hygiene education program started in June 2000

Performance Indicators

Impact Indicators

Percentage of children under <36 months with diarrhea in the last two weeks

Table 3.3.2.2 summarizes the reported diarrhea prevalence and breast-feeding practice among children less than 36 months of age in the two weeks prior to the baseline and mid-term surveys.

Table 3.3.2.2 Diarrhea Prevalence and Breast-feeding Practice in Children
El Salvador - Study Area 2 - La Ceiba, February 2001

Age	Period Prevalence of Diarrhea* (per 100 children)		Percent of Children Breast-fed		Period Prevalence of Diarrhea Breast-feeding (per 100 children)		Period Prevalence of Diarrhea Not Breast-feeding (per 100 children)	
Year	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
≤ 6 months	0 (0/5)	**13 (1/8)**	100% (5/5)	**100% (8/8)**	- (0/5)	**13 (1/8)**	- (0/5)	**- (0/0)**
7-12 months	75 (3/4)	**17 (1/6)**	75% (3/4)	**83% (5/6)**	67 (2/3)	**20 (1/5)**	100 (1/1)	**- (0/1)**
13-24 months	18 (2/11)	**33 (4/6)**	55% (6/11)	**50% (3/6)**	17 (1/6)	**33 (1/3)**	20 (1/5)	**25 (1/4)**
25-36 months	25 (4/16)	**- (0/5)**	31% (5/16)	**20% (1/5)**	60 (3/5)	**- (0/1)**	9 (1/11)	**- (0/3)**
< 36 months	25 (9/36)	**16 (4/25)**	53% (19/36)	**68% (17/25)**	32 (6/19)	**18 (3/17)**	18 (3/17)	**13 (1/8)**

***** Illness occurred within 2 weeks prior to the survey
< less than
≤ less than or equal to

The period prevalence of diarrhea in children less than 36 months of age was 15 cases per 100 children during the mid-term survey. About half of the women with children who were surveyed breast fed their children (26/55). There were 19 cases of diarrhea per 100 children who were breast-fed and 10 cases of children per 100 children with diarrhea who were not breast-fed.

The period prevalence of diarrhea in children less than 36 months of age decreased from 25 per 100 children in the baseline study to 16 per 100 children in the mid-term study. The distribution of diarrhea prevalence varied over the age groups. In the baseline study, the 7 to 12 month age group had the highest period prevalence of diarrhea and the 1 to 6 month age group had the lowest, but in the mid-term study, the 13-24 age group had the highest and the 25-35 age group had the lowest.

The percentage of children who breast-fed increased from 53% (19/36) in the baseline to 68% (17/25) in the mid-term. There was an increase in breast-feeding between the two years in the two younger age groups, but a slight decrease in the two older age groups. There was a decrease in the period prevalence in diarrhea in breast-feeding children from 32 per 100 children to 18 per 100 children between the two years and a decrease in the period prevalence of diarrhea in children not breast-feeding from 18 per 100 to 13 per 100. Overall, in both the baseline and mid-term surveys, the period prevalence for diarrhea was higher for children who were breast-feeding than children who were not breast-feeding.

Quantity of water used per capita per day

The quantity of water used per capita per day is measured as the volume of water collected for each household divided by the number of people in the household. The type of water source and the amount of water used to perform household chores and to bathe impact the per capita daily water use. Because the water system was not completed at the time of the mid-term study, water meters were not installed prior to the mid-term survey to estimate the daily per capita water use of homes with household spigots.

Per capita Daily Water Use

Water usage in the participating households was calculated based on self-reported use of water collected and stored in culturally specific water containers. In the mid-term study, the average volume of water collected per person per day was 23 L (range: 2 to 137 L/person/day). Fifty nine percent (37/63) of the population used more than the Sphere guideline of 15 L/person/day and 6% (4/63) used more than the USAID guideline of 50 L/person/day. A comparison between the baseline and mid-term surveys reveals a decrease in the percentage of people who met the Sphere guidelines from the baseline to the mid-term survey, but the same percentages of households that met the USAID guideline. During the baseline study, the average volume of water collected per person per day was 24 L (range: 0 to 11 L/person/day; median: 22 L/person/day), 73% (53/73) of the households used more than the Sphere guideline, and 6% (4/73) was greater than the USAID guideline.

Water Source and Volume Collected

The residents of La Ceiba used a variety of water sources. The types and distribution of water sources changed after Hurricane Mitch and at the time of the midterm survey, and are expected

to change again once the water interventions have been finalized. Figure 3.3.2.1 shows the water sources before Hurricane Mitch, at the time of the baseline survey, and at the time of the mid-term survey.

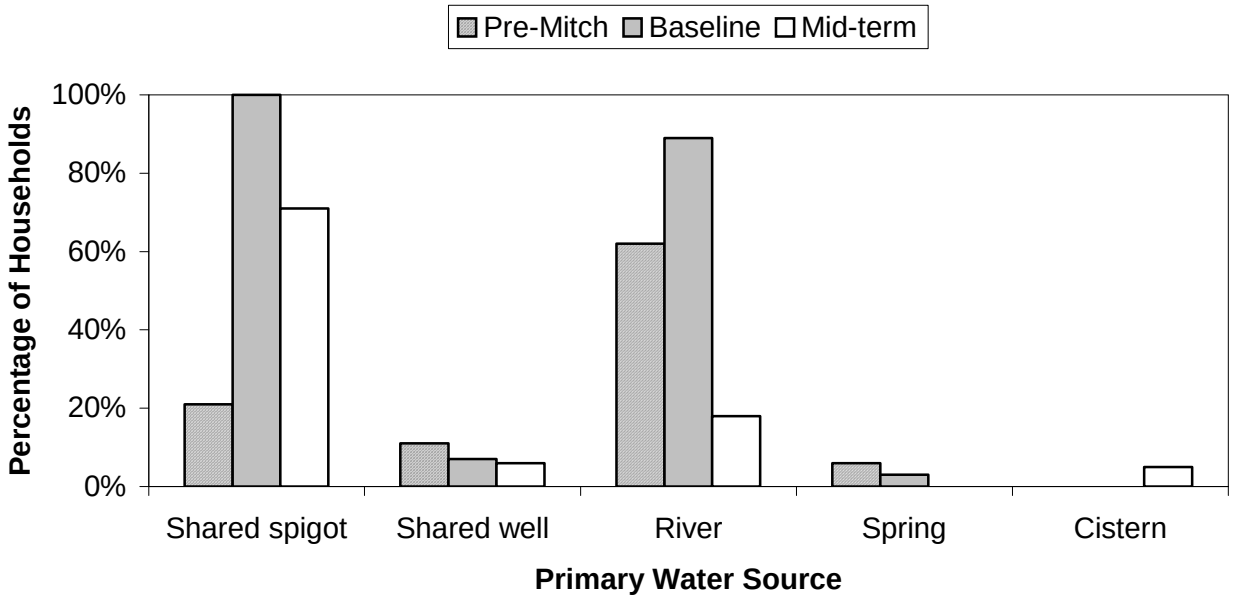

Figure 3.3.2.1 Water Source Before and After Hurricane Mitch and During the Mid-term Survey
El Salvador – Study Area 2 – La Ceiba, February 2001

Prior to the hurricane, the majority of households (62%, 44/66) obtained water from the river. After Hurricane Mitch at the time of the baseline survey, 89% (64/72) of the households obtained their water from the river and 2% from shared spigots. In the mid-term survey, 18% (11/63) of the households obtained their water from the river and 71%(45/63) from shared spigots. Springs had been used as a water source prior to Hurricane Mitch and during the baseline survey, but were not reported as a water source during the mid-term survey. However, cisterns, which hadn't been reported before, were used as a water source at the time of the mid-term survey.

The average volume of water collected by water source is shown in Table 3.3.2.3. The shared spigot provided the greatest average volume of water per household in the mid-term survey (118 L/day). The least amount of water, 4 L/day, was from a shared well. During the baseline survey, participants reported collecting the greatest average volume of water from the river, 130 liters per day, and the least amount reported was collected from a spring (66 L/day).

Table 3.3.2.3 Daily Volume of Water Collected in Each Household by Water Source
El Salvador - Study Area 2 - La Ceiba, February 2001

Water Source	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=72	**2001 N=63**	2000	**2001**	2000	**2001**	2000	**2001**
Shared spigot	1	**45**	NA	**19-319**	88	**118**	88	**91**

Shared well	5	**4**	22-220	**38-176**	123	**103**	110	**99**
River	64	**11**	22-330	**44-176**	130	**91**	110	**80**
Spring	2	**0**	44-88	-	66	-	66	-
Cistern	0	**3**	-	**40-120**	-	**84**	-	**91**

Water Meter Data
In some communities, water meters were installed at households and community water taps to provide an accurate measure of the amount of water used in each home or by a community. However, no water meters were installed in La Ceiba because the water distribution system was not operational at the time of the mid-term survey. (Table 3.3.2.4 is omitted in this section).

Access to Water
The temporal aspect of access to water was measured as the length of time each day people had to wait to get water and if a water source provided water year-round. Fifty two percent (33/63) of households reported that they had to wait to get their water at least some of the time. Of those who had to wait, 61% (20/33) said they had to wait less than 15 minutes, 15% (5/33) had to wait between 15 minutes and a half hour, and 24% (8/23) had to wait longer than a half hour. A lower percentage of households had to wait for water in the baseline survey (35% (25/72)), and the households in the baseline survey spent less time waiting. In the baseline survey 76% (19/25) waited less than 15 minutes, 20% (5/25) waited between 15 minutes and a half hour, and 4% (1/25) waited longer than a half hour.

The access to water slightly increased between the two years. All of the households that participated in the mid-term survey reported having water all day long, while 98% (62/63) reported having water all year round. During the baseline survey, 97% (69/71) of participants had reported having water all day long, while 96% (69/72) reported having water all year long.

Home Water Use
The home water use variables, summarized in Table 3.3.2.5, include the frequency and sites where participants washed clothes and bathed. In the mid-term survey, households reported washing clothes an average of 5 days a week, which is an increase from 4 times a week in the baseline survey. Most households in the mid-term survey reported washing their clothes in the river (98%, 62/32) and the rest reported washing clothes in the home. This is a slight shift from the baseline survey when all of the homes (71/71) reported washing clothes in the river. There was a decrease in the percent of people bathing where they wash their clothes from 99% (70/71) in the baseline survey to 91% (57/63) in the mid-term survey. The percent of people bathing daily increased from 65% (46/71) in the baseline survey to 89% (55/62) in the mid-term survey.

Table 3.3.2.5 Summary of Household Water Use
El Salvador - Study Area 2 - La Ceiba, February 2001

Home Water Use	Baseline Survey 2000	**Mid-term Survey 2001**
Wash clothes (average)	4 times/week	**5 times/week**
Wash clothes at home	0% (/)	**2% (1/63)**
Wash clothes at a neighbor's house	0% (/)	**0% (/)**
Wash clothes in a river/creek	100% (71/71)	**98% (62/63)**
Bathe where they wash clothes	99% (70/71)	**91% (57/63)**

Bathe daily	65% (46/71)	**89% (55/62)**
Bathe at other frequency-3 times/wk	20% (14/71)	**11% (7/62)**

Percentage of child caregivers and food preparers with appropriate hand washing behavior

The assessment of appropriate hand washing knowledge and behavior was based on the interviewees' ability to recite critical times at which they wash their hands and to demonstrate good hand washing technique. Proper hand washing is one of the most effective ways to break the fecal-oral route of disease transmission. Hand washing knowledge was self-reported and behaviors were observed and scored by the interviewer. A passing score was eight correct responses out of ten (8/10) (Billig et al., 1999). Unanswered questions were considered a "no" response The ARC interventions include a health education component that should increase the knowledge and practice of proper hand washing. Hand washing knowledge and behavior of the primary child caregiver and food preparer are shown in Tables 3.3.2.6 and 3.3.2.7.

Primary Child Caregiver

Comparison of the mid-term and baseline surveys shows that there was an increase in the number of passing scores of 8/10 or greater: 28% (20/71) in the baseline survey and 32% (9/28) in the mid-term survey. Hand washing was most frequently reported in the baseline survey before eating (77%) and before cooking (75%) and in the mid-term survey before cooking (71%) and after defecating (68%). Hand washing was least reported after cleaning child's bottom in both surveys. During the mid-term survey, all of the primary child caregivers (25/25) used water to wash their hands and 84% (21/25) used soap.

Table 3.3.2.6 Primary Child Caregiver Hand Washing Knowledge and Behavior
El Salvador - Study Area 2 - La Ceiba, February 2001

Primary Child Caregiver		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	77% (50/65)	**54% (15/28)**
	Before cooking	75% (49/65)	**71% (20/28)**
	Before feeding children	39% (25/65)	**29% (8/28)**
	After defecating	66% (43/65)	**68% (19/28)**
	After cleaning children's bottom	26% (17/65)	**21% (6/28)**
How do you wash your hands? (behavior)	Use water	100% (63/63)	**100% (25/25)**
	Use soap	65% (41/63)	**84% (21/25)**
	Use both hands	87% (55/63)	**96% (24/25)**
	Rub hands 3 times	73% (46/63)	**92% (23/25)**
	Dry hands on towel or air dry	46% (29/63)	**68% (17/25)**
Total passing score (8 of 10)		28% (19/69)	**32% (9/28)**

≥ greater than or equal to

Household Food Preparer

Comparison of the mid-term and baseline surveys shows that there was a decrease in the number of passing scores of 8/10 or greater from the baseline to the mid-term survey: 28% (19/69) in the baseline survey versus 27% (17/63) in the mid-term survey. Hand washing was most frequently reported before eating and before cooking in both the baseline survey and in the mid-term

surveys. Hand washing was least reported after cleaning child's bottom during both surveys. During the midterm survey, all of the household food preparers used water to wash their hands and 88% (52/59) used soap.

Table 3.3.2.7 Household Food Preparer Hand Washing Knowledge and Behavior
El Salvador - Study Area 2 - La Ceiba, February 2001

Household Food Preparer		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	73% (52/71)	**65% (41/63)**
	Before cooking	70% (50/71)	**71% (45/63)**
	Before feeding children	37% (26/71)	**19% (12/63)**
	After defecating	62% (44/71)	**64% (40/63)**
	After cleaning children's bottom	24% (17/71)	**10% (6/63)**
How do you wash your hands? (behavior)	Use water	100% (69/69)	**100% (59/59)**
	Use soap	61% (42/69)	**88% (52/59)**
	Use both hands	86% (59/69)	**93% (55/59)**
	Rub hands 3 times	71% (49/69)	**86% (51/59)**
	Dry hands on towel or air dry	45% (31/69)	**66% (39/59)**
Total passing score (8 of 10)		28% (20/71)	**27% (17/63)**

≥ greater than or equal to

People living in households where there are no children will be less likely to report hand washing activity before or after interaction with children. However, no differences in scoring were made to account for the fact that people who do not live with young children would be less likely to think of these answers than those living with young children. Therefore, the overall hand washing scores of primary child caregivers and food preparers in households with children less than three years of age and households with no children less than three were compared. A higher percentage of survey participants received passing scores in households where there were children: in the households with children, 36% (8/22) of the childcare givers and 36% (8/22) of the food preparers received a passing score while in the households with no children, 2% (1/41) of the child caregivers and 22% (9/41) of the food preparers received a passing score.

Hand Washing Education

The health committee and the Red Cross conducted a majority of the health education workshops (charlas) focusing on hand washing behavior that were reported by the study participants in the mid-term survey. The mid-term survey showed that 92% (58/63) of the households reported receiving a charla on proper hand washing behavior. This is an increase from the baseline survey, in which the majority of the charlas were given by health promoters from the Ministry of Health and only 31% (22/71) of the households reported receiving a charla.

Most of the child caregivers who received a charla (49/58) did not receive a passing score in hand washing. However, the child caregivers who received a charla on hand washing had higher hand washing scores than those that did not. All of the child caregivers who had a passing score had received a charla (9/9). Sixteen percent (9/58) of the child caregivers who received a charla had a passing score while none of the child caregivers who did not receive a charla had a passing score (0/5). This is a change from the baseline survey when a higher percentage of the child

caregivers who did not receive a charla had a passing score than those that did receive a charla: 31% versus 14%. Figure 3.3.2.2 compares the results for the same groups in 2000 and 2001.

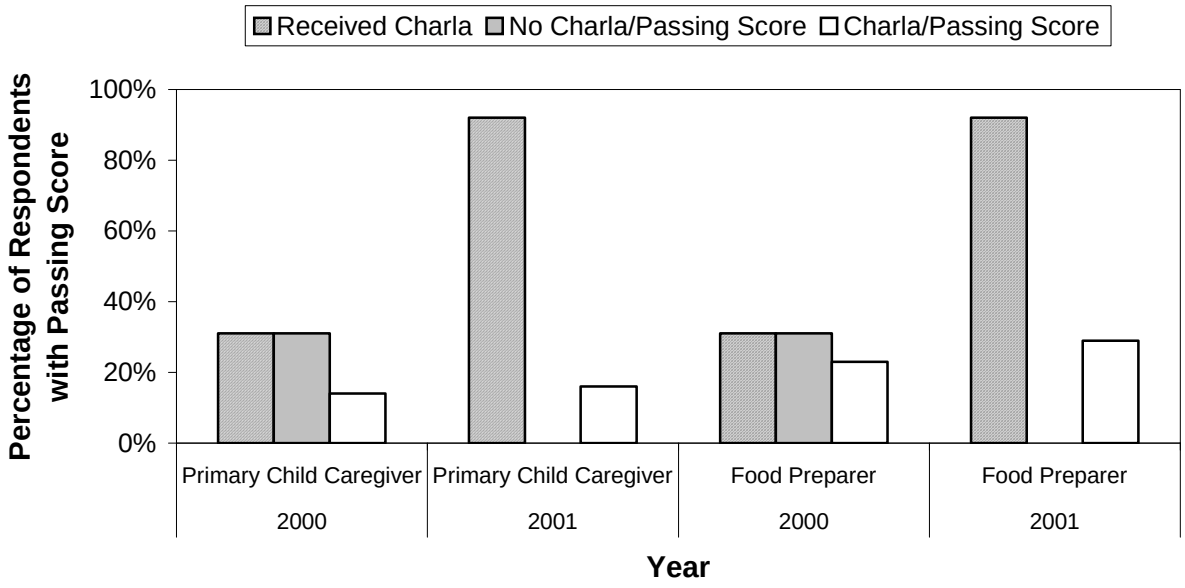

Figure 3.3.2.2 Comparison of Health Education and Hand Washing Scores
El Salvador – Study Area 2 – La Ceiba, February 2001

As seen with the child caregivers, most of the food preparers who had received a charla (41/58) did not receive a passing score. Still, all of the food preparers who had a passing score had received a charla (17/17). Twenty nine percent (17/58) of the food preparers who received a charla had a passing score while none of the food preparers who did not receive a charla had a passing score (0/5). Again, this was a change in comparison with the baseline survey when a higher percentage of food preparers who had not received a charla had a passing score than those that did receive a charla: 31% versus 23%.

Percentage of population using hygienic sanitation facilities

Proper disposal of excreta is essential to protect the health of the community members, particularly children. This indicator focuses on the percentage of the population that used hygienic sanitation facilities, where a sanitation facility is defined as a functioning toilet or latrine where excreta are disposed. This indicator was met if the facility was hygienic and used by household members greater than 12 months of age.

A facility was considered hygienic if there were less than three flies present and no excreta were found outside the latrine. It was considered in use if the latrine had one or more of the following conditions: it had been recently cleaned with water, there was a path to the latrine, there were signs of recently being swept, there were signs of recent repair, and there were no spider webs.

Use of Hygienic Facilities

Table 3.3.2.8 is a summary of the characteristics of the sanitation facilities. The percentage of the percent of the population greater than 12 months of age using a hygienic facility increased from 13% (49/393) during the baseline survey to 43% (149/350) during the midterm survey. The

percentage of respondents reported that they disposed of baby's waste in a latrine decreased from 16% (5/31) in the baseline survey to 14% (2/14) in the mid-term survey. The distance from the sanitation facility to the hand washing area increased from 8 m during the baseline survey to 16 m during the mid-term survey.

Table 3.3.2.8 Sanitation Facility-Use and Practice
El Salvador – Study Area 1 – La Ceiba, February 2001

Sanitation Facilities	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Total population >12 months of age using a latrine	14% (55/393)	**48% (169/350)**
Latrines that are hygienic and in use *	75% (9/12)	**88% (28/32)**
Population > 12 months of age using a hygienic latrine	13% (49/393)	**43% (149/350)**
Dispose of baby's** waste in a latrine	16% (5/31)	**14% (2/14)**
Dispose of baby's waste not in a latrine	84% (26/31)	**86% (12/14)**
Mean distance to hand washing area	8 m	**16 m**

* Hygienic is <3 flies present and no excreta are found outside the latrine. In Use if household members are reported to use the latrine and the latrine has one or more of the following, recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
** baby defined as a child less than 12 months of age
>greater than

Education on Care and Use of Latrines

The Red Cross conducted a majority of the health education charlas focusing on the care and use of latrines that were reported by the study participants. The mid-term survey showed that 92% (58/63) of households reported receiving a charla on the care and use of latrines, an increase from the baseline survey, in which 27% (19/70) households reported that they had received a charla on the care and use of latrines and the majority of the charlas were given by health promoters from the Ministry of Health.

During both the baseline and mid-term surveys, more of the households that had received a charla on the care and use of latrines hygienic had sanitary facilities than those that had not. During the midterm survey, 88% (28/32) of the households that had received a charla had a hygienic sanitary facility, but none of the households that reported not having had a charla had a hygienic sanitary facility (Figure 3.3.2.3).

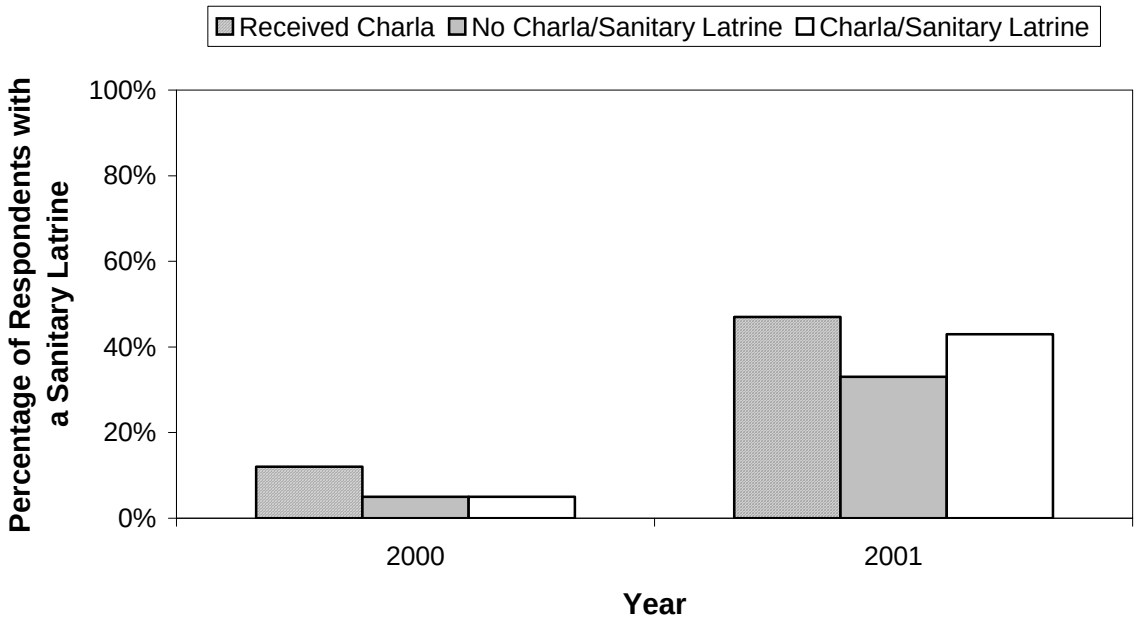

Figure 3.3.2.3 Comparison of Health Education and Sanitary Latrines
El Salvador – Study Area 2 – La Ceiba, February 2001

Monitoring Indicators

Percentage of households with year-round access to water

This indicator is a measure of the homes that have an adequate public, private, or shared water source that is located within 200 meters of the home and is used for drinking, cooking, cleaning, and bathing. No particular level of water quality is implied. Water sources defined as "adequate" may include protected wells and springs, but do not include untreated surface waters.

The percentage of households that had year round access to an improved water source decreased from 6% (4/73) in the baseline survey to 2% (1/63) in the mid-term survey. Although there was an increase in the percentage of households with a protected water source from 10% (8/72) during the baseline survey to 83% (52/63) during the mid-term survey, most of the households were not within the 200 m distance requirement. In the baseline survey, 16% (12/73) households were within 200 meters of the primary water source, whereas, in the mid-term survey, only 2% (1/63) of participating households were within 200 m of the primary water source. The average distance from households to an improved water source increased from 427 m in the baseline study to 781 m in the mid-term study.

The average distance that survey participants traveled to get to their primary water source (regardless of whether it met the requirements of an improved water source) during the midterm survey decreased slightly to 749 m from 778 m during the baseline survey, which had decreased from 1,050 m prior to Hurricane Mitch. Households traveled from 200 to 999 m to get to their water source (median distance of 900 m) during the midterm survey, compared to a range of 0 to 10,000 m (median: 999) during the baseline survey, and a range of 0 to 15,000 m (median 300 m) prior to Hurricane Mitch.

Interviewer estimates of distance from the interviewed household to its water source were greater than estimates of the interviewees. The interviewer data were less complete than the data collected from survey respondents. Interviewer estimates are provided for only 60 households as compared to 63 households reported by interviewees.

Table 3.3.2.9 provides the daily volume of water collected in relation to distance from household to water source. The volume of water collected appears to have no association with the distance from the household to the water source in either the baseline survey or the mid-term survey. In the baseline survey, the smallest volume of water was reported for the shortest distance (≤ 10 meters) and the greatest volume of water was reported for the 11-50 meter distance. No participants of the midterm survey reported traveling less than 200 m during the mid-term survey, and again, the smallest volume of water was reported for the shortest distance traveled (101-200 m) and the greatest volume of water was reported for the 201-500 m distance.

Table 3.3.2.9 Daily Volume of Water Collected in Relation to Distance from Household to Water Source
El Salvador - Study Area 2 - La Ceiba, February 2001

Distance (meters)	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=71	**2001 N=63**	2000	**2001**	2000	**2001**	2000	**2001**
≤10	3	**0**	44-176	-	95	-	95	-
11-50	1	**0**	NA	-	220	-	220	-
51-100	2	**0**	66-88	-	77	-	77	-
101-200	5	**1**	22-264	**NA**	97	**66**	66	**66**
201-500	23	**20**	22-220	**38-319**	115	**117**	110	**80**
501-998	0	**13**	-	**40-273**	-	**116**	-	**91**
≥999	37	**29**	44-330	**19-274**	143	**107**	110	**88**

≤ less than or equal to
≥ greater than or equal to
NA not applicable to this dataset

Percentage of households with access to a sanitation facility

Households were considered to have access to a sanitation facility if that household had a private facility or shared a facility with others in the community. During the mid-term survey, the percentage of households that reported having access to a sanitation facility increased to 51% (32/63) from 18% (13/71) during the baseline survey (Table 3.3.2.10). During both the baseline and the mid-term surveys, most facilities were privately owned however, all of the households with access to sanitation facilities during the baseline survey had dry pit latrines, whereas 87% of those with sanitary latrines during the mid-term survey had composting latrines (Table 3.3.2.10).

Table 3.3.2.10 Household Access and Description of Sanitation Facilities
El Salvador - Study Area 2 - La Ceiba, February 2001

Sanitation Facility	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Access to a latrine	18% (13/71)	**51% (32/63)**
Number of latrines inspected	100% (13/13)	**100% (32/32)**
Private facility	92% (12/13)	**97% (31/32)**
Shared facility	8% (1/13)	**3% (1/32)**
Dry pit latrines	100% (13/13)	**13% (4/32)**
Composting latrines	0% (/)	**87%(28/32)**

Percentage of recurrent costs for water supply services provided by the community served

This indicator cannot be assessed until the water supply interventions are completed.

Percentage of constructed water supply systems operated and maintained by the communities served

This indicator cannot be assessed until the water supply systems are completed in all study areas.

Water Quality Testing

The results of the analyses of the community water source and household water samples are summarized in Table 3.3.2.11. None of the water samples were analyzed using the portable DelAgua Water Testing Kit because of the lack of supplies necessary to process the samples. The presence/absence of total coliforms and *E. coli* were detected using the PurTest Kit.

Table 3.3.2.11 Community and Household Water Sources Receiving Treatment and Coliform Results
El Salvador - Study Area 2 - La Ceiba, February 2001

Water Tested	Sample Size (N)		Water Treated		Percent of Samples Positive for Total coliforms		*Percent of Samples* Positive for *E.coli*	
Year	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
Community source	6	**5**	0% (0/6)	**40% (2/5)**	100% (6/6)	**100% (5/5)**	100% (6/6)	**100% (5/5)**
Household samples	13	**10**	0% (0/13)	**40% (4/10)**	100% (13/13)	**70% (7/10)**	100% (13/13)	**60% (6/10)**

Community Water Source

At the time of the mid-term survey, most people were getting their water from the wet well where there was an open spigot, to which people had continuous access. One water sample was taken from the community spigot at the wet well, and one was taken from the spigot at the tank where the water originates. Additionally, three samples were taken from surface water sources. During the baseline survey, all of the six samples were collected from surface water.

The PurTest kit was used to test for the presence of total coliform bacteria and *E. coli* in each of the community water samples. Although two of the community water samples came from a protected water source (the wet well and from the tank), all of the community water samples tested positive for the presence of total coliforms and *E. coli*. During the baseline survey, all community water samples also tested positive for coliform bacteria.

Household Water Samples

Household water samples were taken from water stored in the house for drinking and tested for the presence of total coliforms and *E. coli* using the PurTest kit. As shown in Table 3.3.2.11, 70% (7/10) of the samples were contaminated with total coliforms and 60% (6/10) were contaminated with *E. coli*. The percentage of household drinking water samples that was contaminated with total coliforms decreased from 100% in the baseline study to 70% in the mid-term study, and from 100% to 60% for *E. coli*.

Forty percent (4/10) of the households where water samples were taken reported treating their water on the day of the interview. Of these households, 75% (3/4) had water that was contaminated with total coliforms or *E. coli*. Of the six households that did not treat their water on the day of the interview, 100% (6/6) were contaminated.

Quality Assurance

Because no samples were tested using the DelAgua Kit, the quality of the water testing data was based on the analysis of the sterile water blank and the duplicate water samples. No bacteria grew in the sterile water blank analyzed, indicating that sterile conditions were adequately maintained during processing of the water samples. The duplicate sample provided the same results as the original sample.

Storage, Handling and Treatment

A summary of the way water is stored, handled and treated in the home is provided in Table 3.3.2.12. Water storage and handling improved in La Ceiba from the time of the baseline to the time of the mid-term survey. During both the baseline and mid-term surveys, all of the homes stored water for household use and specifically stored drinking water in the home. The percentage of households covering their stored drinking water increased from 84% (56/67) in the baseline survey to 97% (61/63) in the mid-term survey. Fewer respondents dipped a cup into the drinking water to get a glass of water in the mid-term survey than in the baseline study: 13% (8/63) as compared to 48% (35/71). More respondents in the mid-term survey served water by pouring it from the storage vessel than in the baseline survey: 87% (55/63) as compared to 51% (36/71).

The treatment of water improved between the baseline and mid-term surveys. In the baseline study, 9% (6/71) reported they treated the water on the day of the survey and 35% (25/71) reported they usually treat their water. In the mid-term study, 65% (41/63) reported they treated their water on the day of the survey and 81% (51/63) reported they usually treat their water. Of the people who reported treating their water in the mid-term survey, 88% (45/51) treated it with chlorine.

Table 3.3.2.12 Summary of Water Storage, Handling and Treatment
El Salvador – Study Area 2 – La Ceiba, February 2001

Technique	Baseline Survey 2000	**Mid-term Survey 2001**
Storage and Handling		
Stored water at home	100% (72/72)	**100% (63/63)**
Stored drinking water	100% (72/72)	**100% (63/63)**
Covered drinking water	84% (56/67)	**97% (61/63)**
Dip in a cup for water	48% (35/71)	**13% (8/63)**
Pour water into a cup/glass	51% (36/71)	**87% (55/63)**
Treatment		
Treated water day of survey	9% (6/71)	**65% (41/63)**
Always treated their water	10% (7/71)	**56% (35/63)**
Sometimes treated their water	25% (18/71)	**25% (16/63)**
Never treated their water	65% (46/71)	**19% (12/63)**
Treat water with chlorine	82% (22/25)	**88% (45/51)**
Treat water by boiling	4% (1/25)	**0% (/)**
Other method of treatment-ash	8% (2/25)	**12% (6/51)**

Water Treatment Education

The Health Committee and the Red Cross conducted a majority of the health education charlas focusing on the care and use of latrines that were reported by the study participants. The mid-term survey showed that 91% (57/63) of households reported receiving a charla on the care and use of latrines, an increase from the baseline survey, in which only 48% (34/71) households reported that they had received a charla on the care and use of latrines and the majority of the charlas were given by health promoters from the Ministry of Health.

To determine if the charlas that focused on how to treat and care for household water affected the behavior of the beneficiaries, we compared reported actions by participants who had received a charla on the treatment and care of water to reported actions of participants who had not received a charla (Figure 3.3.2.4). All of the households, regardless of whether they had received a charla, stored water and stored drinking water in their households. A slightly higher percentage of households that hadn't had a charla had covered drinking water: 100% vs. 97%. Of the households that had stored drinking water, a higher percentage of households that had not received a charla served the water from the container by dipping a cup into it (17% vs. 12%), but an equal percentage obtained water by pouring it into a cup or glass (83% vs. 83%).

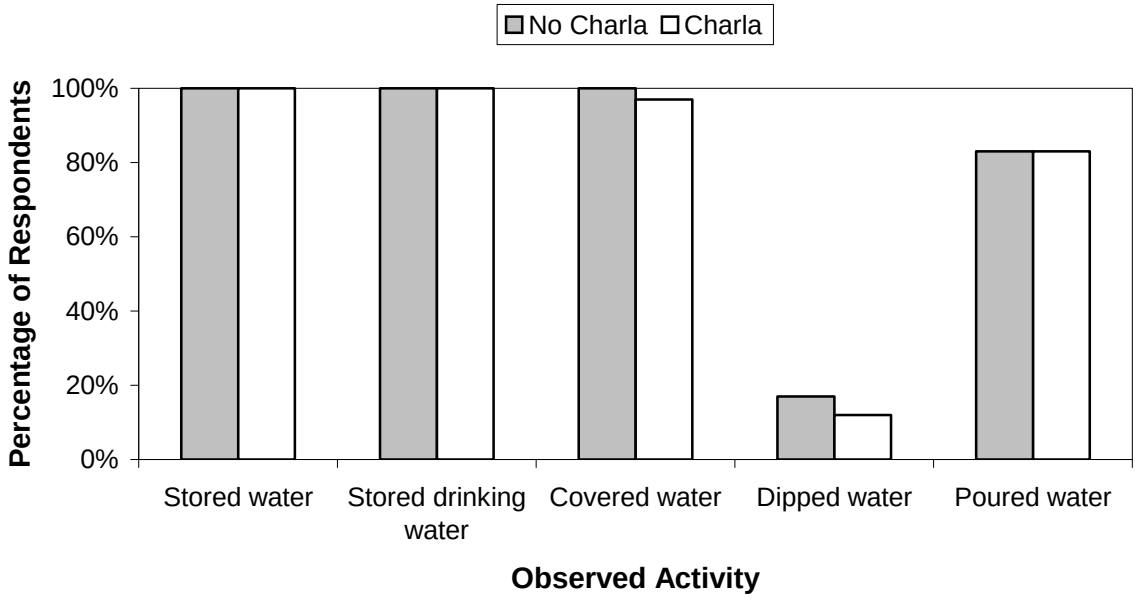

Figure 3.3.2.4 Water Storage Activities Observed by Interviewer in Relation to Receiving a Charla on Proper Storage and Handling of Water
El Salvador – Study Area 2 – La Ceiba, February 2001

Differences were noted between observed and reported water treatment behaviors between the participants who had received a charla and those who had not (Figure 3.3.2.5). A higher percentage of households that had received a charla reported treating the water on the day of the survey (67% vs. 50%) and treating their water at least sometimes (84% vs. 50%). However, a higher percentage of households that did not receive a charla reported using chlorine (100% vs. 88%). Regardless of charla status, no households reported boiling their water to sterilize it.

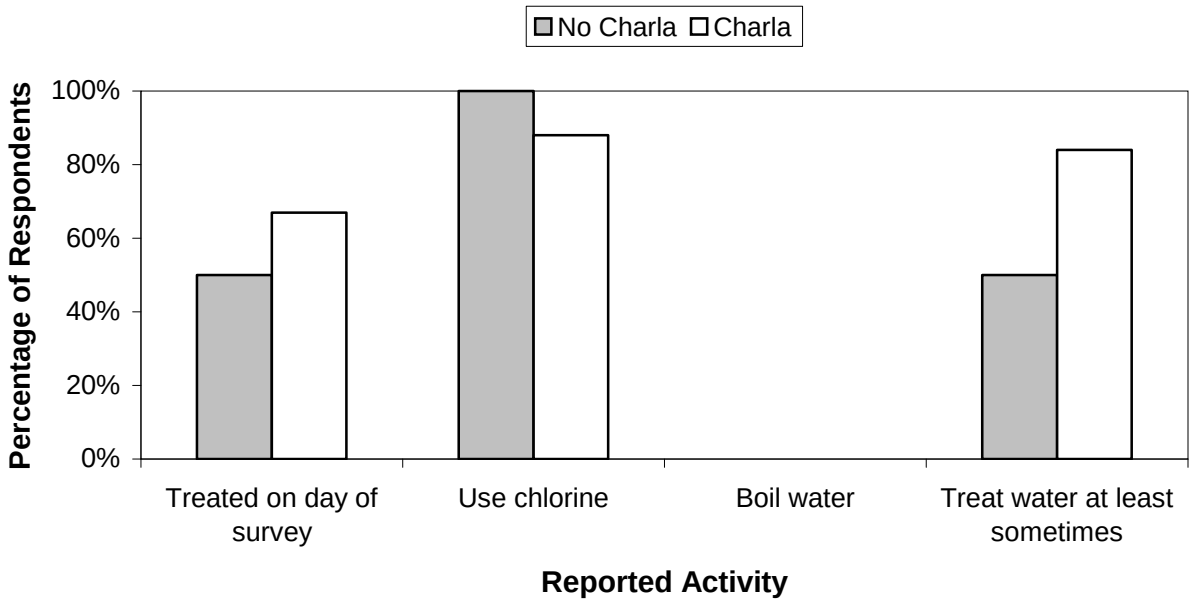

Figure 3.3.2.5 Water Treatment Activities Reported by Study Participants in Relation to Receiving a Charla on Proper Treatment of Water
El Salvador – Study Area 2 – La Ceiba, February 2001

Discussion

The baseline and mid-term survey USAID Impact Indicators in La Ceiba are summarized in Table 3.3.2.13. Important developments and improvements were made between the two years in the community's access to water and sanitary facilities, and to health education classes. These improvements were evident despite hardships experience in the community following major earthquake activity during the months before and the month of the mid-term survey. It should be recognized that the interventions are in progress and the final survey in February 2002 will clearly define the impact of the interventions on this community. Nevertheless, at the time of the mid-term survey the final goal had been met for the decrease in the period prevalence of diarrhea in children less than 36 months of age, and progress was made toward the goals for access to and use of hygienic sanitary facilities and increased percentage of child caregivers that practice appropriate hand washing behavior.

Table 3.3.2.13 Performance Indicators
El Salvador - Study Area 1 - La Ceiba, February 2001

Performance Indicator	USAID Guideline	Status During Baseline Survey (2000)	Final Goal (2002)	Status During Mid-term Survey (2001)	Percent Difference : Baseline to Mid-term[1]	Progress To Goal: Baseline to Mid-term[2]	Status Relative to Final Goal[3]
Impact Indicator							

Children under <36 months with diarrhea in the past 2 weeks[4]	25% decrease	25 (9/36)	≤19	16 (4/25)	36% decrease	NA	>100%
Quantity of water used per capita per day	100% using 50 Lpd	6% (4/73)	100%	6% (4/63)	NA	0% increase	6%
Child caregiver with appropriate hand washing behavior	50% increase	28% (19/69)	≥42%	32% (9/28)	14% increase	NA	28%
Food preparers with appropriate hand washing behavior	50% increase	28% (20/71)	≥42%	27% (17/63)	4% decrease	NA	0%
Population using hygienic sanitation facilities[5]	75% usage	13% (49/393)	≥75%	43% (149/350)	NA	30% increase	57%
Monitoring Indicator							
Households with year-round access to water[6]	NE	6% (4/73)	100%[7]	2% (1/63)	NA	4% decrease	2%
Households with access to a sanitation facility	NE	18% (13/71)	100%[7]	51% (32/63)	NA	33% increase	51%

1 Calculated ONLY for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values
2 Calculated ONLY for indicators with goals with an absolute goal (e.g., 100%) by subtracting the baseline value from the mid-term value
3 Status with respect to the final goal for each indicator, calculated for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values divided by the goal, calculated for those with an absolute goal (e.g., 100%) by dividing the mid-term value by the goal; >100% indicates that the goal was exceeded
4 Goal is a reduction in the number of cases of diarrhea per 100 children in the study population.
5 A facility is considered hygienic if there are less than 3 flies present and no excreta are found outside the latrine. A latrine is IN USE if latrine it has one or more of the following conditions: recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
6 Water source is less than 200 meters away from the household and there is access to water year-round.
7 Goal was established by the American Red Cross
NE none established

Impact Indicators

Diarrhea is usually associated with diet, breastfeeding status, access to water, quality of water, hand washing practices, and access to sanitary facilities. The two-week period prevalence of diarrhea in children less than 36 months of age decreased from 25 cases per 100 children to 16 cases per 100 children from the baseline to the mid-term survey. This was a 36% decrease, which surpassed the USAID goal of a 25% decrease in the two-week period prevalence of diarrhea. This decrease in diarrhea prevalence is encouraging, because none of the interventions

had been completed at the time of the mid-term survey and because of the problems that arose as a result of the earthquakes in January and February 2001.

The percentage of children who were breastfeeding increased between the baseline and mid-term surveys, but the period prevalence of diarrhea in children who were not breastfeeding was higher than in those who were breastfeeding. Although health education classes had begun, the hand washing practices, as revealed by the hand washing scores, had not improved significantly between the two years. However, the increase in the percentage of people with access to hygienic latrines, and the increase in the percentage of people treating their water and storing their drinking water appropriately are all factors that raised the level of hygiene in the community and contributed to the decrease in diarrhea in children less than 36 months of age.

During both the baseline and mid-term surveys, 6% of the households had access to the USAID guideline of 50 L water per person per day. The average per capita daily water use decreased slightly between the two years from 24 l/p/d to 23 l/p/d, which was a 4% decrease in average water quantity available per person. However, the water intervention had not been completed and there had been slight damage to the water infrastructure during the most recent earthquakes. The shift from using the river as the source for household water to shared spigots reflects an improvement in access to a protected water source.

The results from the tests for appropriate hand washing behaviors were mixed for La Ceiba. There was an increase in the percentage of child caregivers demonstrating appropriate hand washing behavior (as demonstrated by a passing score) from 28% (19/69) to 32% (9/28) between the two years and a decrease in the percentage of food preparers with a passing hand washing score. The decrease of period prevalence of diarrhea in children may be associated with the improved hand washing practices of the child caregivers. However, it is interesting to note that fewer respondents participated in the child caregiver section of the survey during the mid-term survey, decreasing to 28 respondents from 69 respondents during the baseline survey.

The percentage of food preparers demonstrating appropriate hand washing behavior remained essentially the same, decreasing from 28%(20/71) to 27%(17/63) between the two years. The lack of improvement is unexpected because the health education campaign had already begun at the time of the mid-term survey. However, both the child caregivers and the food preparers who received health education on appropriate hand washing behavior had better hand washing practices than those who did not receive health education.

There was an increase in the percentage of the population using hygienic facilities from. The proportion of people with access to hygienic facilities made impressive progress toward the final goal increasing three-fold, from 13% (49/393) in the baseline survey to 43% (149/350) in the mid-term survey. Although the percentage of people using hygienic latrines did not meet the goal of 75% of the population having access to hygienic facilities, the increase in access is a direct result of the latrine construction conducted by the ARC, and is on target to reach the goal during the final survey, after the interventions are completed.

Monitoring Indicators

There was a decrease in the percentage of households with year-round access to improved water from 6% (4/73) in the baseline survey to 2% (1/63) in the mid-term survey. Thus, no progress was made toward the final goal of 100% of households having year-round access to improved water. The two factors necessary for a water source to be considered improved are that the household primarily obtains water from a protected source (not surface water) and the source is within 200 meters of the household. Access to a protected water source increased from 10% (8/72) to 83% (52/63), as the community switched from the river to a shared spigot at the newly constructed well as their primary water source. However, access to water source within 200 meters of the household decreased from 16%(12/73) to 2% (1/63) because the community spigot at the wet well is further from most houses than the river. The water intervention was not completed at the time of the mid-term survey, and the construction of a distribution system and household spigots will allow all households ready access to their water source.

Another component of the temporal aspect of access to water is the length of time people wait to get water. In the mid-term survey, households reported that they had to wait for a longer period of time to obtain water than those in the baseline survey, which is not surprising because the respondents of the midterm survey waited for water at the shared spigot, as opposed to going to the river to get their water.

Access to a sanitation facility increased from 18% (13/71) in the baseline survey to 51% (32/63) in the mid-term survey, but did not meet the goal of 100% coverage of households with sanitation facilities. However, the latrine coverage increased nearly three-fold from the baseline to the mid-term study, and will meet the goal of 100% coverage when the latrine construction project is completed. The percentage of participants that reported access to private latrines and composting latrines increased from the baseline to the midterm survey, reflecting the fact that the ARC project includes building composting latrines for each household in the community.

The percentage of latrines that were hygienic and in use also increased, from 75% (9/12) during the baseline survey to 88% (28/32) during the mid-term survey. Those survey participants who had received a charla on the care and use of a latrine were more likely to use a hygienic latrine than those who had not received a charla.

Water Quality Analysis

Water quality testing revealed a similar level of contamination in the community water samples between the two years, but a decrease in the contamination in the household water samples. There was no association between treatment of community water sources and contamination of water. However, there was a 25% reduction in the percentage of participating households that reported that they treated water on the day of sampling whose water tested positive for fecal contamination from the baseline to the midterm survey, suggesting that the charlas on proper storage and treatment of water effectively taught community residents how to treat their stored drinking water.

Recommendations

The CDC recommends that the ARC continue the planned interventions for La Ceiba. The mid-term survey revealed progress toward the final goal on many of the impact and monitoring indicators.

Water

CDC recommends the ARC complete the planned water intervention for La Ceiba, at which time each household will have its own household spigot. Because each household will have a private spigot, health education classes should be continued to emphasize the importance of the proper care and treatment of household water.

Sanitation

CDC recommends the ARC complete of the sanitary intervention in La Ceiba, so that each household has a private composting latrine. The distance between the latrine and the hand washing area, which increased between the baseline and mid-term survey, should be reduced. Health education classes should emphasize the importance of proper use and care and of household latrines.

Hand Washing Behavior

CDC recommends the ARC strengthen the health education classes in La Ceiba on appropriate hand washing to better convey the message of proper methods to wash hands and stress the importance of the message in improving health. More emphasis could be placed on the role proper hand washing plays in preventing diarrhea and other illnesses.

Water Quality Testing

CDC recommends the ARC verify the water quality of water sources in La Ceiba, establish a systematic water testing system, and create a water treatment program for the community water sources. A protocol to maintain the quality of water in the community water sources should be developed. The water committee should receive the proper training to maintain all aspects of the water project once the water project is completed.

Guatemala

Study Area 1 - Chiquimula

On February 2 and 3, 2000, 197 surveys were conducted with randomly selected households in six communities in Chiquimula where ARC was considering interventions. After the baseline survey was conducted, three of the six communities: Despoblado, Guayabo, and Plan Shalagua (referred to as Plan y Travesia in the baseline report) were selected for interventions. Therefore, the baseline survey report covers the 87 households that participated in the survey in those three communities.

During the implementation phase of the intervention program, ARC decided to perform interventions only in the communities of Guayabo and Plan Shalagua, but not in Despoblado. Therefore, in February 2001, the study area consisted of the communities of Guayabo and Plan Shalagua. This report compares baseline data from the 57 households in these two communities that participated in the survey in February 2000 with the data collected from the 96 households participating in the mid-term survey in February 2001. A community survey was completed with those knowledgeable of the water and sanitation conditions of the community. Twenty water samples were randomly collected from households where interviews were being conducted.

A team of eight interviewers, the ARC in-country wat-san and health delegates, and one CDC investigator conducted 96 interviews in the two communities on February 7 and 8, 2001. There was excellent participation, with 99% (95/96) of the contacted households agreeing to participate. Thirty eight percent (37/94) of the participating households reported having participated in the study the previous year.

Community Description

The study area consisted of the communities of Guayabo and Plan Shalagua. These communities are in the Chiquimula Region of Guatemala near the border with Honduras. This is a rural and mountainous region, and each community is located at least an hour from the main road by car. Interviews were conducted with the community water committees and the ARC wat-san delegate to obtain background information on the communities.

Guayabo

The president, secretary, treasurer, and two committee members of the water and sanitation committee, and the in-country ARC wat-san delegate completed the community survey in Guayabo. At the time of the baseline and mid-term surveys, the committee felt that upgrading their water supply was the community's greatest need.

At the time of the mid-term survey, Guayabo consisted of 135 houses with a total of 810 people, who are Chorti and speak Spanish. A council of community members governs the people. The primary forms of employment are agriculture (corn, beans, sorghum) and day labor. The general education level of the community is third grade.

The community received no food aid following Hurricane Mitch. The community has access to health care at a Ministry of Health (MINSA) health post that is 4 km away in Caparjá. At the time of the mid-term survey, the community health promoters had participated in two training sessions focusing on sanitation, hygiene, and use of water. The first training was offered by MINSA in December 1999 at the health post in Caparjá. The ARC and MINSA offered the second training in January 2001 at the local church.

At the time of the mid-term survey, the primary water source for the residents of Guayabo was two hand-dug wells. These wells are located 300 meters from the closest houses in valleys on either end of the town. During dry periods when the wells run dry, residents get their water from local streams. The water in the wells was tested in February 2000 by the ARC and by MINSA in October 2000. The analysis by the ARC revealed that the well water was contaminated with fecal coliform bacteria. MINSA did not report the results of their water analysis to the community. At the time of the mid-tem survey, the households did not pay a fee for their water, and the water was not routinely treated at a community level. However, the wells are periodically cleaned.

Dry pit latrines were constructed for all homes in 1993. However, only 18 of the homes were still using the latrines at the time of the mid-term survey.

Plan Shalagua

The president, vice president, and tribune of the pro-development committee, a community member, and the in-country ARC wat-san delegate completed the community survey in Plan Shalagua. At the time of the mid-term survey, the committee felt that the community's greatest need was to gain access to a television-based secondary school program.

At the time of the mid-term survey, the community consists of 84 houses with approximately 400 people who are Chorti and speak Spanish. A council of community members governs them. The primary forms of employment are agriculture and day labor. Generally, the adults have not had an opportunity to attend school, whereas the children have a fourth-to-fifth grade education.

The community received no food aid following Hurricane Mitch. The community has local access to health care at a MINSA health post in a neighboring barrio, which is a 15-minute walk. The ARC offered an educational program focusing on sanitation, hygiene and water use for the health promoters in May 2000 at the health post.

At the time of the mid-tem survey, the community's main water supply was a capped spring fed by gravity into a water storage tank, and a distribution system leading to shared and private taps. This system was built in 1987. Since 1996, the community has experienced periodic outages of water from the taps because of sediment buildup in the pipes. The water committee cleans out the pipes when sediment accumulates in them to the point where water availability is affected. The people rely on natural wells or the river for their water during periods of low water pressure. Between the time of the baseline survey and the mid-term survey, the water system was effectively destroyed due to sediment accumulation and breakages of the distribution lines. The water was tested by MINSA at the time the system was constructed, but MINSA did not report the results of the analysis to the community.

The households did not pay a regular fee for their water service at the time of the mid-term survey, but the water committee takes up a collection in emergency situations. The water was not routinely treated at a community level, however, the tank was cleaned and chlorine was added every several months.

The community has no formal sanitation system. About 15% of the homes had dry pit latrines at the time of the mid-term survey; however, the committee reported that these latrines are out of service.

Demographic Information

The mean household size during the mid-term survey was 6.0 people per household, which was less than the household size of 6.7 people per household found in the baseline survey. On average, 0.8 children less than 36 months of age lived in each house, which is slightly greater than the baseline survey, in which 0.7 children less than 36 months of age lived in each house.

During the mid-term survey 99% (95/96) reported living in their own home, and 1% (1/96) lived with friends or family. The percentage of people living in their own homes was about the same as that reported in the baseline survey; during which 98% (56/57) of households were living in their own home, 2% (1/57) were living in temporary housing.

Education

The education level of the population participating in the mid-term survey was similar to that found during the baseline survey. A mean education level of less than one year was reported in both the baseline and mid-term surveys. During the mid-term survey, the participants reported having zero to six years of formal education, with 76% (73/96) of participants having no formal education, and 9% (9/96) of participants having completed at least three years of education. During the baseline survey, 90% (51/57) of participants had no formal education, and 9% (5/57) had at least three years of education.

Status of Intervention

The interventions planned by the ARC were community-specific and based on existing resources and needs. The perceived community need before the intervention (i.e., February 2000) and the ARC planned intervention are summarized in Table 3.4.1.1. (i.e., February 2000) and the intervention planned by the ARC. Additionally, this table lists the status of each intervention at the time of the mid-term survey.

Table 3.4.1.1 Community Needs, Planned Interventions and Status of Interventions
Guatemala - Study Area 1- Chiquimula, February 2001

Country/ Study Area	Perceived Community Need	Planned Intervention	Status of Intervention as of February 2001
Guatemala - Chiquimula	Plan Shalagua: Improve water system	• Upgrade the water system ♦Household latrines + Education program- hygiene, water use, and sanitation	• Water system improvements in progress; water meters in some homes; water committee established ♦Latrines under construction + 1/3 of people have had hygiene and latrine education
	Guayabo: Improve water system	• New water system- household taps ♦Household latrines + Education program- hygiene, water use, and sanitation	• Water system planned; water committee established ♦Latrines construction complete + Education on hygiene and latrine construction and maintenance done by ARC

Performance Indicators

Impact Indicators

Percentage of children under <36 months with diarrhea in the last two weeks

Table 3.4.1.2 summarizes the reported diarrhea prevalence and breast-feeding practice among children less than 36 months of age in the two weeks prior to the baseline and mid-term surveys.

Table 3.4.1.2 Diarrhea Prevalence and Breast-feeding Practice in Children
Guatemala - Study Area 1 - Chiquimula, February 2001

Age	Period Prevalence of Diarrhea* (per 100 children)		Percent of Children Breast-fed		Period Prevalence of Diarrhea Breast-feeding (per 100 children)		Period Prevalence of Diarrhea Not Breast-feeding (per 100 children)	
	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
≤6 months	25 (2/8)	**8 (1/12)**	100% (8/8)	**100% (12/12)**	25 (2/8)	**8 (1/12)**	0 (0/0)	**0 (0/0)**
7-12 months	67 (6/9)	**41 (7/17)**	100% (9/9)	**94% (16/17)**	67 (6/9)	**38 (6/16)**	0 (0/0)	**100 (1/1)**
13-24 months	33 (4/12)	**34 (12/35)**	30% (3/10)	**71% (25/35)**	0 (0/3)	**32 (8/25)**	43 (3/7)	**40 (4/10)**
25-35 months	0 (0/4)	**8 (1/12)**	33% (1/3)	**0% (0/12)**	0 (0/1)	**0 (0/0)**	0 (0/2)	**8 (1/12)**
< 36 months	40 (12/30)	**28 (21/76)**	70% (21/30)	**70% (53/76)**	38 (8/21)	**28 (15/53)**	33 (3/9)	**26 (6/23)**

* Illness occurred within 2 weeks prior to the survey
< less than
≤ less than or equal to

The period prevalence of diarrhea in children less than 36 months of age decreased to 28 cases per 100 children in the mid-term survey, from 40 per 100 children during the baseline survey. The period prevalence of diarrhea increased slightly between the baseline and the mid-term surveys in the two older age groups (13 to 24 months and 25 to 35 months). However, the period prevalence of diarrhea decreased in the two younger age groups (7 to 12 months and 13 to 24 months).

The percentage of breast-feeding children remained the same between the baseline and the mid-term surveys. Overall, the period prevalence for diarrhea during the mid-term survey was nearly the same for children who were breast-feeding (28 per 100 children) and those who were not breast-feeding (26 per 100 children). At the time of the baseline survey, the period prevalence of diarrhea was also about the same in children who were breast-feeding as those who were not breast-feeding (38 per 100 children versus 33 per 100 children).

Quantity of water used per capita per day

The quantity of water used per capita per day is measured as the volume of water collected for each household divided by the number of people in the household. The type of water source, the distance to water, and the amount of water used to perform household chores and to bathe affect the per capita daily water use. Water meters were installed prior to the mid-term survey on a subset of household and shared taps to estimate the daily per capita water use of homes with household spigots. These data were compared to the self-reported volumes from all households using household and shared taps.

Per Capita Daily Water Use

The calculation of water usage in the participating households was based on self-reported use of water collected and stored in culturally specific water containers. On average, 13 L of water were collected per person per day during both the baseline and mid-term surveys. During the mid-term survey, 26% (25/96) of the study population met the Sphere guideline of collecting 15 L/person/day to meet basic water needs during emergency situations, and only 1% (95/96) met the USAID guideline for the volume of water collected in non-emergency situations of 50 L/person/day. The number of households meeting the Sphere and USAID guidelines did not change from the baseline to the mid-term survey. During the baseline survey 23% (12/57) of participants reported collecting at least 15 L/ person/day, and 3% (2/57) reported collecting at least 50 L/ person/day.

Water Source and Volume Collected

Figure 3.4.1.1 summarizes the water sources before and after Hurricane Mitch and at the time of the mid-term survey. There was little change in the types and distribution of water sources used in Chiquimula before and after Hurricane Mitch, with roughly equal numbers of households obtaining water from shared spigots (39%) and shared wells (39% to 43%). During the mid-term survey, the number of households obtaining water from shared wells increased to 52% (50/96), while households getting water from shared spigots decreased to 27% (26/96).

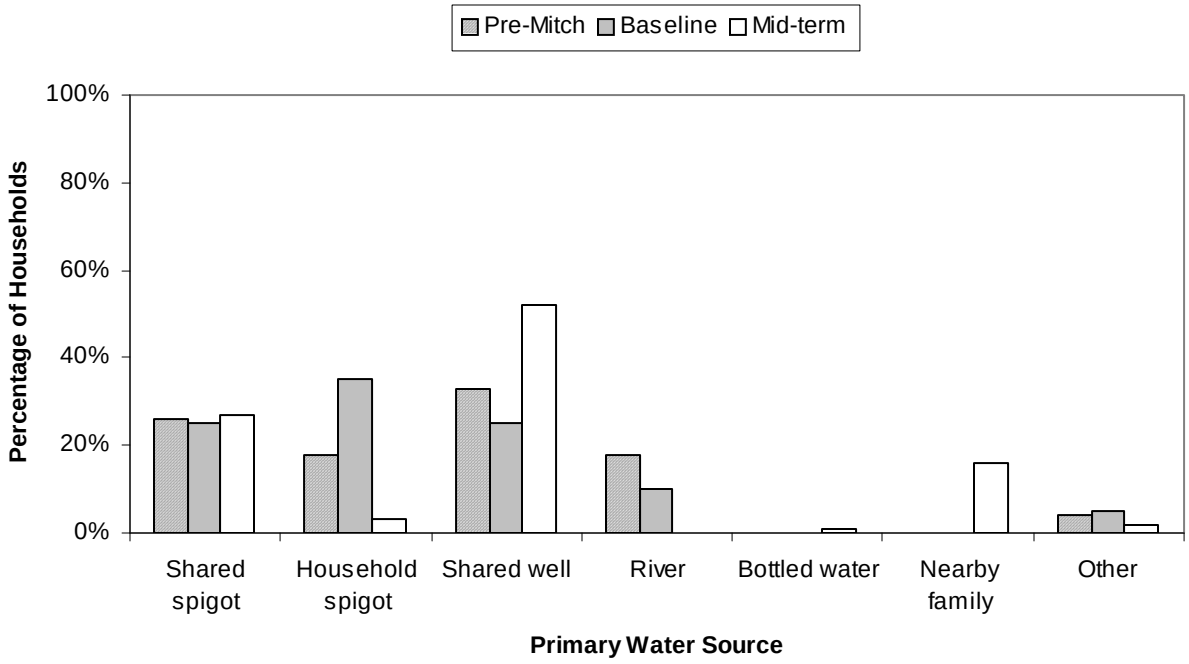

Figure 3.4.1.1 Water Source Before and After Hurricane Mitch and During the Mid-term Study Guatemala - Study Area 1 - Chiquimula, February 2001

The volume of water collected by water source is shown in Table 3.4.1.3. The mid-term survey indicated that household spigots provided the greatest volume of water per household, an average of 130 L/day. The least amount of water, 52 L/day, was collected from rivers or creeks. During

the baseline survey, participants reported collecting the greatest volume of water from shared spigots (103 L/day), and the least amount from shared wells and household spigots (52 L/day).

Table 3.4.1.3 Daily Volume of Water Collected in Each Household by Water Source
Guatemala - Study Area 1 - Chiquimula, February 2001

Water Source	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=51	**2001 N=94**	2000	**2001**	2000	**2001**	2000	**2001**
Shared spigot	20	**26**	40-285	**23-570**	103	**95**	91	**54**
Household spigot	4	**3**	12-106	**72-228**	52	**130**	46	**91**
Shared well	21	**50**	4-134	**15-150**	52	**64**	46	**68**
Household well	0	**0**	-	**-**	-	**-**	-	**-**
River/creek	6	**15**	23-114	**15-137**	88	**52**	103	**46**

Water Meter Data

Water meters were installed on four private taps and six shared taps in Chiquimula (Plan Shalagua) to provide an accurate measure of the amount of water used in homes with taps. Six to eight families obtained water from each of the shared taps. The meters tracked the water use of 42 families. The water meter data was collected weekly from January 17 to February 8, 2001 and provided five weeks of meter measurements. Table 3.4.1.4 summarizes of the water meter data. The average measured daily water use per household was 346 L, and the median value was 218 L. The average measured water use was 2.5 times greater in households using private taps (562 L/day) than in households using shared taps (201 L/day).

The measured water use was greater than the reported water use. The average measured water use in households using private taps (562 L/day) was more than four times the volume that households with private taps reported collecting (130 L/day). Likewise, the average measured water use in households using shared spigots (201 L/day) was twice the volume that households using shared taps reported collecting (95 L/day).

Table 3.4.1.4 Water Meter Data Summary
Guatemala – Study Area 1 – Chiquimula, February, 2001

Type of Meter	Number of meters	Number of households	Range of Daily Water Use (L/day)	Average Daily Volume (L/day)	Median Daily Water Use (L/day)
All	10	42	64-1165	346	218
Private	4	4	207-1165	562	438
Shared	6	38	64-412	201	143

Access to Water

The temporal aspect of access to water was measured as the length of time each day people had to wait to get water and if a water source provided water all year-round. During the mid-term survey, 28% (27/96) of households reported that they had to wait to get water at least some of the time. The time that the people had to wait was evenly distributed among all of the time range

categories given in the questionnaire, with approximately 25% of households waiting in each time range, from less than 15 minutes to greater than one hour. The amount of time spent waiting for water increased compared to the baseline survey. During the baseline survey, 54% (12/22) of participants who reported waiting for water waited for less than 15 minutes, but only 26% (7/27) of participants during the mid-term survey reported waiting less than 15 minutes to collect their water.

Approximately the same percentage of people reported having water all day long during the baseline survey, 97% (55/57), and the mid-term survey, 93% (89/96). More people in the baseline survey reported that their primary water source provided water all year long (56%, (32/57) than those participating in the mid-term survey (27%, 25/94).

Home Water Use

The home water use variables, summarized in Table 3.4.1.5, include the frequency and sites where participants washed clothes and bathed. During the mid-term survey, households reported washing clothes from one to seven days per week. On average, participants reported washing clothes three times per week. People generally reported washing clothes in the same places during the baseline and mid-term surveys. The number of households that reported bathing in the same place they washed clothing increased from 84% (46/46) during the baseline survey to 96% (92/96) during the mid-term survey. More participants reported that they bathed daily during the mid-term survey, 31% (30/96), than during the baseline survey, 25% (14/56), whereas more participants reported bathing three times per week, 46% (26/57), during the baseline survey compared to the mid-term survey, 32% (31/96).

Table 3.4.1.5 Summary of Household Water Use
Guatemala - Study Area 1 - Chiquimula, February 2001

Home Water Use	Baseline Survey 2000	**Mid-term Survey 2001**
Wash clothes (average)	3 times/week	**3 times/week**
Wash clothes at home	29% (16/56)	**27% (26/96)**
Wash clothes in the river	57% (32/56)	**51% (49/96)**
Wash clothes at a well	13% (7/56)	**22% (21/96)**
Bathe where they wash clothes	84% (46/55)	**96% (92/96)**
Bathe daily	25% (14/57)	**31% (30/96)**

Percentage of child caregivers and food preparers with appropriate hand washing behavior

The ARC interventions include a health education component that is designed to increase the knowledge and practice of proper hand washing. Appropriate hand washing knowledge and behavior were assessed based on the interviewees' ability to recite critical times at which they wash their hands and to demonstrate good hand washing technique. Proper hand washing is one of the most effective ways to break the fecal-oral route of disease transmission. These data were self-reported and observed by the interviewer who scored the responses. A passing score was eight or more correct responses out of ten (8/10) (Billig et al., 1999). Unanswered questions were considered a "no" response. Hand washing knowledge and behavior of the primary child caregiver and food preparer is shown in Tables 3.4.1.6 and 3.4.1.7.

Primary Child Caregivers

The number of passing scores of greater than 8/10 on the test of primary child caregeivers' hand washing knowledge and practice decreased from 12% (7/57) in the baseline survey to 9% (5/57) in the mid-term survey. Hand washing was most frequently reported before cooking in both surveys, and hand washing was least reported after cleaning children's bottoms in both surveys. More participants reported knowledge of the appropriateness of washing one's hands after defecating and before eating in the mid-term survey than in the baseline survey. Likewise, the percentage of participants who used soap, washed both hands, and rubbed their hands together at least three times increased during the mid-term survey. However, the percentage of participants drying their hands in the air or on a towel decreased during the mid-term survey.

Table 3.4.1.6 Primary Child Caregiver Hand Washing Knowledge and Behavior
Guatemala - Study Area 1 - Chiquimula, February 2001

Primary Child Caregiver		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	42% (24/57)	**56% (32/57)**
	Before cooking	84% (48/57)	**77% (44/57)**
	Before feeding children	23% (13/57)	**25% (14/57)**
	After defecating	26% (15/57)	**42% (24/57)**
	After cleaning children's bottom	16% (9/57)	**18% (10/57)**
How do you wash your hands? (behavior)	Use water	98% (52/53)	**100% (56/56)**
	Use soap	53% (28/53)	**64% (36/56)**
	Use both hands	74% (39/53)	**100% (56/56)**
	Rub hands 3 times	51% (27/53)	**98% (55/56)**
	Dry hands on towel or air dry	26% (14/53)	**18% (10/56)**
Total passing score (8 of 10)		12% (7/57)	**9% (5/57)**

≥ greater than or equal to

Household Food Preparer

The number of passing scores of 8/10 on the test of food preparers' hand washing knowledge and practice decreased from 12% (7/57) in the baseline survey to 6% (6/95) in the mid-term survey. In both surveys, hand washing was most frequently reported before cooking and least reported after cleaning children's bottoms. The trends in knowledge of appropriate times to wash hands and performance of the hand washing elements were similar to those for the primary child caregiver.

Table 3.4.1.7 Household Food Preparer Hand washing Knowledge and Behavior
Guatemala - Study Area 1 - Chiquimula, February 2001

Household Food Preparer		Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
When do you wash your hands? (knowledge)	Before eating	42% (24/57)	**55% (52/95)**
	Before cooking	84% (48/57)	**77% (73/95)**
	Before feeding children	23% (13/57)	**22% (21/95)**
	After defecating	26% (15/57)	**43% (41/95)**
	After cleaning children's bottom	16% (9/57)	**11% (10/95)**

How do you wash your hands? (behavior)	Use water	98% (52/53)	**99% (93/94)**
	Use soap	53% (28/53)	**56% (53/94)**
	Use both hands	74% (39/53)	**98% (92/94)**
	Rub hands. 3 times	53% (28/53)	**93% (87/94)**
	Dry hands on towel or air dry	25% (13/53)	**18% (17/94)**
Total passing score (8 of 10)		12% (7/57)	**6% (6/95)**

≥ greater than or equal to

People living in households where there are no children will be less likely to report hand washing activity before or after interaction with children. However, no differences in scoring were made to account for the fact that people who do not live with young children would be less likely to think of these answers than those living with young children. Therefore, the overall hand washing scores of primary child caregivers and food preparers in households with children less than three years of age and households with no children less than three were compared. Nine percent (5/56) of primary child caregivers in households with children less than three years of age had a passing score. The single primary child caregiver that did not have children less than three years of age did not have a passing score. A similar comparison was done for food preparers living in households with or without children under the age of three. Nine percent (5/56) of the food preparers in households with children less than three years of age had a passing score, whereas 3% (1/39) of the food preparers that did not have children less than three years of age had a passing score.

Hand Washing Education

The percentage of survey participants who reported receiving a health education workshop (charla) on proper hand washing behavior during the mid-term survey, 50% (48/96) increased in comparison with the baseline survey, in which 40% (21/53) of the households had received a charla (Figure 3.4.1.2). During the mid-term survey, participants reported that the ARC had conducted a majority of the charlas focusing on proper hand washing behavior (54%, 26/48), whereas the Centro de Salud offered most of the charlas reported during the baseline survey. Most charlas during the mid-term survey were done at the school with the entire community or with groups from the community. Thirty percent of respondents indicated that the most recent charla on hand washing techniques took place three to four months before the interview and 21% indicated that it had been one year since the last charla on this topic.

During both the baseline and mid-term surveys, less than 15% of the primary child caregivers and food preparers had passing hand washing scores, regardless of whether they had received a charla. During the mid-term survey, however, the percentage of primary child caregivers who reported having received a charla that had a passing hand washing score was three times the percentage of those who did not report receiving a charla. Likewise, the percentage of food preparers who reported having a charla that had a passing hand washing scores was twice the percentage of those who did not report receiving a charla (Figure 3.4.1.2).

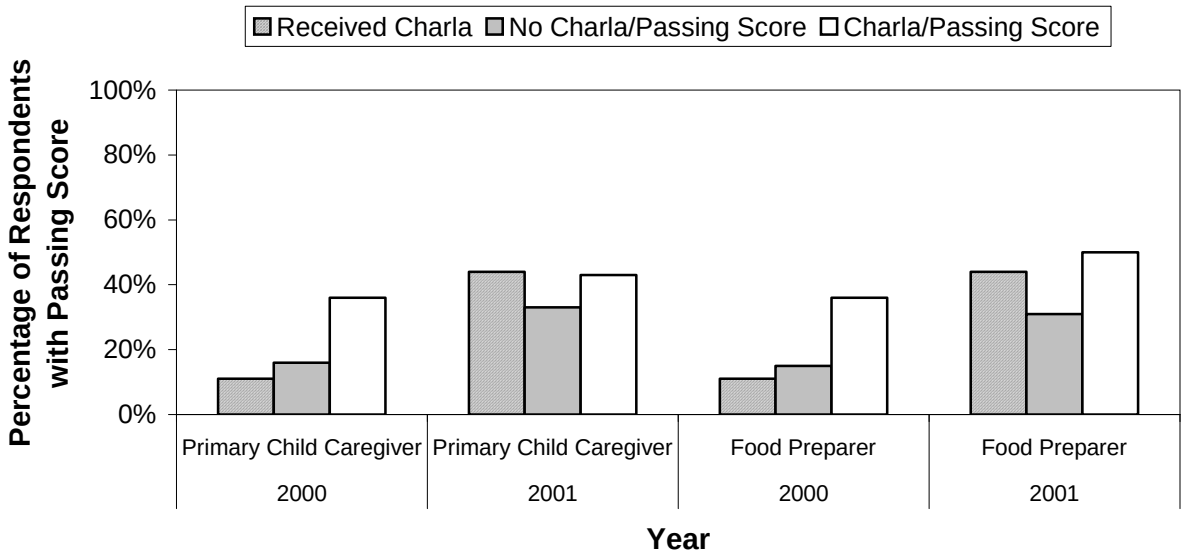

Figure 3.4.1.2 Comparison of Health Education and Hand Washing Scores
Guatemala – Study Area 1 – Chiquimula, February 2001

Percentage of population using hygienic sanitation facilities
Proper disposal of excreta is essential to protect the health of the community members, particularly children. This indicator focuses on the percentage of the population that uses hygienic facilities. Proper disposal of excreta is essential to protect the health of the community members, particularly children. A sanitation facility was defined as a functioning toilet or latrine where excreta are disposed. This indicator was met if the facility was hygienic and used by household members greater than 12 months of age.

A facility was considered hygienic if there were less than three flies present and no excreta were found outside the latrine. It was considered in use if the latrine had one or more of the following conditions: it had been recently cleaned with water, there was a path to the latrine, there were signs of recently being swept, there were signs of recent repair, and there were no spider webs.

Use of Hygienic Facilities
Table 3.4.1.8 summarizes the characteristics of the sanitation facilities. The population using a latrine, the population using a hygienic latrine, and the number of latrines used that were hygienic all increased at the time of the mid-term survey compared to the baseline survey.

Table 3.4.1.8 Sanitation Facility-Use and Practice
Guatemala – Study Area 1 – Chiquimula, February 2001

Sanitation Facilities	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Total population >12 months of age using a latrine	17% (60/357)	**24% (134/552)**
Latrines that are hygienic and in use *	60% (12/20)	**70% (19/27)**
Population >12 months of age using a hygienic* latrine	15% (54/357)	**18% (100/552)**
Dispose of baby's** waste in a latrine	14% (6/43)	**11% (4/35)**

Mean distance from latrine to hand washing area	12 m	**17 m**

* Hygienic is <3 flies present and no excreta are found outside the latrine. In use if household members are reported to use the latrine and the latrine has one or more of the following, recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
** baby defined as a child less than 12 months of age
>greater than

Education on Care and Use of Latrine

The percentage of households that reported receiving a charla on the care and use of latrines (46% (44/96)) increased during the mid-term survey compared to the baseline survey, in which 16% (9/55) of households had received such a charla (Figure 3.4.1.3). The ARC conducted 68% (39/44) of the charlas on care and use of latrines reported by the study participants during the mid-term survey; whereas the Ministry of Health gave most of the charlas reported during the baseline survey. Most charlas focusing on care and use of latrines that were reported during the mid-term survey took place in the health center or the school with the female head of household or with the entire community.

During the baseline survey, similar percentages of respondents who had received a charla on the care and use of latrines had access to sanitary latrines as those that didn't receive a charla. However, at the time of the mid-term survey, 50% more of the latrines belonging to people who received a charla were hygienic compared to latrines belonging to those not receiving a charla (Figure 3.4.1.3).

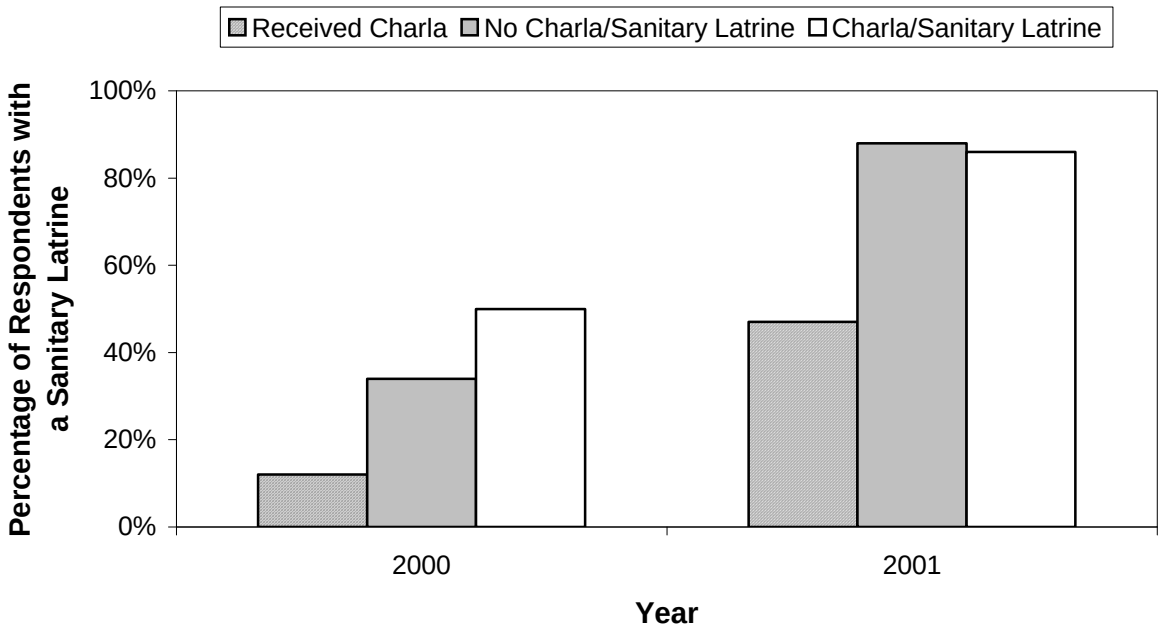

Figure 3.4.1.3 Comparison of Health Education and Sanitary Latrines
Guatemala – Study Area 1 – Chiquimula, February 2001

Monitoring Indicators

Percentage of households with year-round access to water

This indicator is a measure of the homes that are directly connected to a piped system or that have an adequate public private or shared water source that is located within 200 meters of the home, and is used for drinking, cooking, cleaning, and bathing. No particular level of water quality is implied. Water sources defined as "adequate" may include wells and springs, but do not include untreated surface waters.

The percentage of households with year-round access to an improved water source within 200 meters decreased from 37% (21/57) in the baseline study to 11% (11/96) in the mid-term study. The percentage of households reporting use of an improved water source, regardless of the distance traveled to reach it, was similar during the baseline (89%, 51/57) and mid-term surveys (84%, 81/96). Compared to the baseline survey, the mid-term survey showed an overall decrease in the average distance to an improved water source. In the baseline study the average distance to an improved water source reported by interviewers was 94 meters (m) and in the mid-term survey it was 88 m. However, those reporting using a water source within 200 m decreased in the mid-term survey (61%, 59/96) compared to the baseline survey (72%, 41/57), as did the number of people reporting that their primary water source provided water during the whole year: 26% in the mid-term survey compared to 56% in the baseline survey.

At the time of the mid-term survey, participants reported traveling from 3 m to 1200 m to reach their water source, with a mean distance of 222 m. The median distance traveled to get water was 200 m. Households reported traveling an average of 246 m to get water prior to Hurricane Mitch (median 150 m), with a range of 0 m to 2000 m. The median distance participants reported traveling to get water after Hurricane Mitch increased from 150 m at the time of the baseline survey to 200 m at the time of the mid-term survey.

Interviewer estimates of the distance from the interviewed household to its water source were slightly greater than the estimates of the interviewees (i.e., mean distance of 246 m and a median distance of 200 m for the interviewer estimates). There was a more complete dataset for this variable for the interviewers than the participants because many participants did not report their perception of the distance to the water source; 80% (77/96) of households had interviewee reported distances, whereas 99% (95/96) had interviewer reported distances.

As shown in Table 3.4.1.9, at the time of the mid-term survey the volume of water decreased with increasing distance from the household to the water source. Large decreases in the volume of water collected were seen when the water source was greater than 10 m away and when the water source was greater than 50 m away. The volume of water collected was fairly constant at distances greater than 50 m. During the baseline study there was no association between distance to water source and volume collected.

Table 3.4.1.9 Daily Volume of Water Collected in Relation to Distance from Household to Water Source
Guatemala - Study Area 1 - Chiquimula, February 2001

Distance (meters)	Number of Households		Daily Volume (liters/day)					
			Range		Average		Median	
	2000 N=79	**2001 N=95**	2000	**2001**	2000	**2001**	2000	**2001**
≤10	7	**6**	12-108	**51-302**	73	**149**	80	**114**
11-50	7	**11**	73-171	**23-570**	83	**101**	69	**46**
51-100	10	**20**	23-134	**27-114**	70	**62**	63	**65**
101-200	15	**22**	4-285	**15-171**	72	**64**	46	**51**
201-500	12	**27**	23-163	**15-91**	80	**61**	69	**68**
501-998	0	**9**	-	**19-150**	-	**74**	-	**60**
≥999	3	**1**	23-69	**45**	51	**45**	57	**45**

≤ less than or equal to
≥ greater than or equal to

Percentage of households with access to a sanitation facility

Access to and types of latrines inspected during the baseline and mid-term surveys are summarized in Table 3.4.1.10. Households were considered to have access to a sanitation facility if that household had a private facility or shared a facility with others in a community. Thirty seven percent (35/94) of participants reported that they had access to a dry pit latrine before Hurricane Mitch. Nearly all of the latrines (97%, 34/35) were private. Approximately the same percentage of households, 43% (20/47), had access to sanitation during the baseline survey. However, during the mid-term survey, the percentage of households that reported having access to a sanitation facility decreased to 29% (28/96).

Table 3.4.1.10 Household Access and Description of Sanitation Facilities
Guatemala – Study Area 1 – Chiquimula, February 2001

Sanitation Facility	Percent Baseline Survey 2000	**Percent Mid-term Survey 2001**
Access to a latrine	43% (20/47)	**29% (28/96)**
Number of latrines inspected	23	**28**
Private facility	5% (1/20)	**0% (0/28)**
Shared facility	95% (19/20)	**100% (28/28)**
Dry pit latrines	100% (22/22)	**100% (28/28)**
Composting latrine	0% (0/22)	**0% (0/28)**
Pour flush latrines	0% (0/22)	**0% (0/28)**

Percentage of recurrent costs for water supply services provided by the community served

This indicator cannot be assessed until the water supply interventions are completed.

Percentage of constructed water supply systems operated and maintained by the communities served

This indicator cannot be assessed until the water supply systems are completed in all study areas.

Water Quality Testing

The results of the analyses of the community water source and household water samples are summarized in Table 3.4.1.11. The microbial indicators of fecal contamination used for this study, total coliform bacteria and *Escherichia coli,* were measured in colony forming units (CFU) per 100 ml (CFU/100 ml) using the DelAgua water testing kit (Oxfam, 2000). Using this method, the analyst counts the number of colonies that form on a membrane filter that is incubated on nutrient media after a known volume of the sample water has been passed through it. A subset of samples was analyzed in duplicate using the DelAgua kit, and a subset of samples was analyzed by a qualitative test using the PurTest kit to confirm the presence or absence of total coliforms and *E.coli*. A sterile water blank was analyzed with each batch of samples to verify that sterile conditions were being maintained.

Table 3.4.1.11 Community and Household Water Sources Receiving Treatment and Coliform Results
Guatemala - Study Area 1 - Chiquimula, February 2001

Water Tested	Sample Size (N)		Water Treated		Percent of Samples Positive for Total coliforms		Percent of Samples Positive for *E. coli*	
Year	2000	**2001**	2000	**2001**	2000	**2001**	2000	**2001**
Community source	2	**6**	0% (0/2)	**0% (0/6)**	50% (1/2)	**83% (5/6)**	50% (1/2)	**50% (3/6)**
Household samples	3	**9**	33% (1/3)	**22% (2/9)**	67% (2/3)	**100% (9/9)**	33% (1/3)	**67% (6/9)**

Community Water Source

The two communities that make up this study area used three major sources of water at the time of the mid-term survey. Two shared spring-fed wells provided the majority of the water in Guayabo. In Plan Shalagua, water from a spring is fed by gravity to a tank and is then distributed to shared and private water taps located in the village. Seven community water sources were tested: three shared wells in Guayabo, two shared water taps in Plan Shalagua, the tank in Plan Shalagua (to determine if the source water was contaminated), and a river that flows through Plan Shalagua which provides water when flow from the distribution system is inadequate.

Eighty three percent (5/6) of the community water samples tested positive for total coliforms and 50% (3/6) tested positive for *E. coli* during the mid-term survey. If the total number of bacterial colonies exceeded 200 per membrane the sample results were recorded as "too numerous to count (TNTC). The density of total coliform bacteria measured in the community water samples ranged from 40 CFU/100 ml to TNTC. The density of *E. coli* measured in the community water samples ranged from 4 CFU/100 ml to TNTC.

The number of community water samples contaminated was greater for total coliforms and the equivalent for *E. coli* during the mid-term survey compared to the baseline survey. Fifty percent (1/2) of samples from community water sources that were analyzed during the baseline survey were positive for total coliform bacteria and *E. coli,* compared to 83% and 50%, for total coliform bacteria and *E. coli,* respectively, during the mid-term survey.

Household Water Samples

Household water samples were taken from water stored in nine households for drinking. As shown in Table 3.4.1.11, 100% of the samples were contaminated with total coliforms. During the mid-term survey, the density of total coliform bacteria in household water samples ranged from 588 CFU/100 ml to TNTC, which is similar to the results of the baseline survey, in which total coliform bacteria ranged from 255 CFU/100 ml to TNTC. Forty-three percent (3/7) of household water samples taken during the mid-term survey were positive for E. coli. The density of E. coli in household samples that tested positive for E. coli decreased during the mid-term survey in comparison to the baseline survey. E. coli counts ranged from and 6 to 108 CFU/100 ml during the mid-term survey, whereas the range was 1 CFU/100 ml to TNTC for the baseline survey.

More of the household water samples were contaminated with total coliforms and less were contaminated with *E. coli* during the mid-term survey, compared to the baseline survey. All of the samples from household water sources that were analyzed during the mid-term survey (9/9) were positive for total coliform bacteria and 67% (6/9) were positive for *E. coli*, compared to 67% (6/9) positive for total coliform bacteria and 33% (3/9) positive for *E. coli* during the baseline survey.

Quality Assurance

One water sample was analyzed in duplicate using the DelAgua kit. There was good agreement between the duplicate total coliforms analyses of the water sample. Fifty-eight CFU total coliform bacteria/100 ml water were counted in one duplicate sample and 40 CFU/100ml were counted in the second duplicate sample. However, *E. coli* was detected at very low levels (4 CFU/100 ml) in one of the duplicate samples and none was found in the other sample. This difference could be due to chance, or because the procedure used to sterilize the filtration apparatus did not inactivate all *E. coli* from a previous sample. However, no bacteria grew in the sterile water blanks analyzed, indicating that sterile conditions were adequately maintained during processing of the water samples.

The results of the duplicate analyses run using PurTest kit were generally in agreement with the results found using the DelAgua kit. The three samples tested positive for total coliforms using both kits. The three samples tested positive for *E. coli* using the PurTest kit and 2/3 tested positive for *E. coli* using the DelAgua kit.

Storage, Handling and Treatment

A summary of the way participants stored, handled and treated their household water is shown in Table 3.4.1.12. Nearly all of the households reported storing water for drinking and other purposes at the time of the mid-term and the baseline surveys, 98% (95/96) and 97% (54/56),

respectively. The percentage of households that covered their stored drinking water increased from 42% (22/53) during the baseline survey to 68% (65/95) during the mid-term survey. The percentage of households serving water from the storage container by dipping in a cup decreased from 7% (4/57) to 2% (2/93) from the time of the baseline to the mid-term survey, while pouring water from the storage container increased from 81% (46/57) to 98% (91/93).

During the same time period, the number of households always and sometimes treating their water decreased from 33% (15/46) to 22% (21/95), and 26% (12/46) to 15% (14/95), respectively, while the percentage of households never treating their water increased from 41% (19/46) to 63% (60/95). The number of households that reported treating their household water with chlorine increased from 26% (7/27) to 42% (15/36), while the number of households that reported boiling their household water decreased from 70% (19/27) to 59% (21/36),

Two of nine (22%) of households where water was sampled reported treating their water on the day of the interview. These two samples tested positive for total coliform bacteria, and one of the samples tested positive for *E. coli*. Each of the seven household water samples that were reported as not treated tested positive for total coliforms and five of the samples tested positive for *E. coli.*

Table 3.4.1.12 Summary of Water Storage, Handling and Treatment
Guatemala – Study Area 1 – Chiquimula, February 2001

Technique	Baseline Survey 2000	Mid-term Survey 2001
Storage and Handling		
Store water at home	95% (53/56)	**98% (94/96)**
Stored drinking water	97% 954/56)	**99% (95/96)**
Covered drinking water	42% (22/53)	**68% (65/95)**
Dip in a cup for water	7% (4/57)	**2% (2/93)**
Pour water into a cup/glass	81% (46/57)	**98% (91/93)**
Treatment		
Treated water day of survey	32% (18/56)	**26% (24/94)**
Always treated their water	33% (15/46)	**22% (21/95)**
Sometimes treated their water	26% (12/46)	**15% (14/95)**
Never treated their water	41% (19/46)	**63% (60/95)**
Treat water with chlorine	26% (7/27)	**42% (15/36)**
Treat water by boiling	70% (19/27)	**59% (21/36)**
Other methods of treatment	0% (0/27)	**3% (1/36)**

Water Treatment Education

The percentage of households that reported receiving a charla on how to treat household water survey increased from 40% (36/91) during the baseline survey to 49% (47/96) during the mid-term survey. The Ministry of Health conducted the majority of charlas reported by the study participants during the baseline study, whereas ARC conducted a majority of the water storage and treatment charlas reported during the mid-term survey (39%, 18/46). Most of the charlas reported at the time of the mid-term survey were given in the school with the entire community. Twenty-nine percent of respondents indicated that the most recent charla on water storage and treatment handling of water took place one year before the interview and 24% indicated that it had been three to four months since the last charla on this topic.

Charlas had no apparent affect on the practices used to store and retrieve stored water for drinking (Figure 3.4.1.4). In fact, fewer of those who reported receiving a charla on storage and treatment of water covered their water while storing it or used hygienic techniques to get drinking water out of their storage containers than those who had not received a charla. However, participants who received a charla were more likely to report having treated their water on the day of the survey, 30% (14/46), compared to those who did not receive a charla, 21% (10/48) (Figure 3.4.1.5). People who had received a charla also indicated that they always or sometimes treated their drinking water more frequently than those who had not received a charla, and more indicated that they use chlorine.

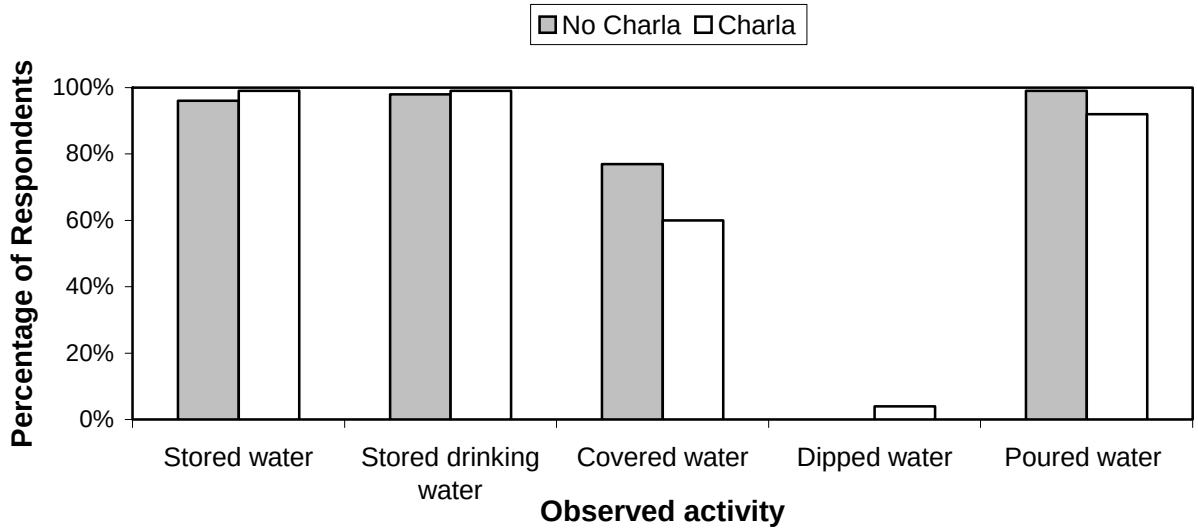

Figure 3.4.1.4 Water Storage Activities Observed by Interviewer in Relation to Receiving a Charla on Proper Storage and Handling of Water
Guatemala - Study Area 1 - Chiquimula, February 2001

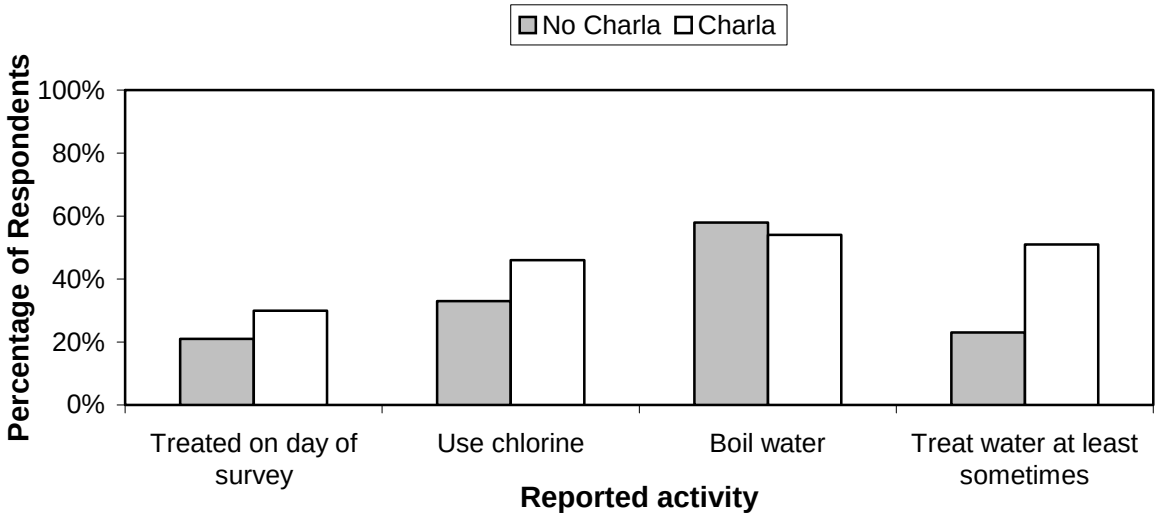

Figure 3.4.1.5. Water Treatment Activities Reported by Study Participants in Relation to Receiving a Charla on Proper Treatment of Water
Guatemala - Study Area 1 - Chiquimula, February 2001

Participants in five of the nine households where water samples were taken reported having received a charla on the storage and treatment of household water. Forty percent (2/5) of water samples taken from these five households was free of *E. coli* contamination, compared with 75% (3/4) of water samples taken from households where the participant had not received a charla. All of the household water samples were contaminated with total coliform bacteria, whether or not the participant had received a charla on storage and treatment of water.

Discussion

The baseline and mid-term survey USAID Performance Indicators in Chiquimula are summarized in Table 3.4 1.13. Comparison of these data shows that, although the goal of decreasing the 2-week period prevalence of diarrhea by 25% had been met by the time of the mid-term survey, most of the other indicators of access to and use of improved water and sanitation services and appropriate hygiene behavior had not improved. Each indicator is discussed below, followed by discussions of additional data collected about water (volume, storage, treatment, and quality), sanitation, and hand washing.

Table 3.4.1.13 Performance Indicators
Guatemala - Study Area 1 - Chiquimula, February 2001

Performance Indicator	USAID Guideline	Status During Baseline Survey (2000)	Final Goal (2002)	Status During Mid-term Survey (2001)	Percent Difference : Baseline to Mid-term[1]	Progress To Goal: Baseline to Mid-term[2]	Status Relative to Final Goal[3]
Impact Indicator							

Children under <36 months with diarrhea in the past 2 weeks[4]	25% decrease	40 (12/30)	≤30	28 (21/76)	38% decrease	NA	>100%
Quantity of water used per capita per day	100% using 50 Lpd	3%	100%	1%	NA	2% decrease	1%
Child caregiver with appropriate hand washing behavior	50% increase	12% (7/57)	≥18%	9% (5/57)	25% decrease	NA	0%
Food preparers with appropriate hand washing behavior	50% increase	12% (7/57)	≥18%	6% (6/95)	50% decrease	NA	0%
Population using hygienic sanitation facilities[5]	75% usage	15% (54/357)	≥75%	18% (100/552)	NA	3% increase	24%
Monitoring Indicator							
Households with year-round access to water[6]	NE	37% (21/57)	100%[7]	11% (11/96)	NA	26% decrease	11%
Households with access to a sanitation facility	NE	43% (20/47)	100%[7]	29% (28/96)	NA	14% decrease	14%

1 Calculated ONLY for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values
2 Calculated ONLY for indicators with goals with an absolute goal (e.g., 100%) by subtracting the baseline value from the mid-term value
3 Status with respect to the final goal for each indicator, calculated for indicators with goals of a specific percent change (e.g., 25% decrease) as the percent change between the baseline and mid-term values divided by the goal, calculated for those with an absolute goal (e.g., 100%) by dividing the mid-term value by the goal; >100% indicates that the goal was exceeded
4 Goal is a reduction in the number of cases of diarrhea per 100 children in the study population.
5 A facility is considered hygienic if there are less than 3 flies present and no excreta are found outside the latrine. A latrine is IN USE if latrine it has one or more of the following conditions: recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair and no spider webs.
6 Water source is less than 200 meters away from the household and there is access to water year-round.
7 Goal was established by the American Red Cross
NE none established

Impact Indicators

The period prevalence of children less than 36 months of age with diarrhea decreased from 40 per 100 children during the baseline survey to 28 per 100 children during the mid-term survey. This decrease meets the USAID goal of a 25% decrease in diarrhea prevalence in children of this age group following water and sanitation and hygiene education. However, the number of children less than 36 months of age was too sparse to get a good estimate of the true diarrhea rates of the children in this study area during the baseline and mid-term surveys (the sample size of each study area was chosen so that the samples could be pooled to compare the prevalence of diarrhea before and after the interventions on a regional basis), so these results cannot be viewed as conclusive. Still, this decrease may indicate an improvement in the health status of the children in this study area. The water system had not been installed at the time of the mid-term survey in one of the communities in this study area, the improvements to the water system in the other community were underway, and the latrines were not yet constructed. If used effectively, these infrastructure improvements will contribute toward decreasing the risk of diarrheal disease among young children in these communities.

The prevalence of diarrhea decreased in both breast-feeding and non breast-feeding children in the mid-term study compared to the baseline study, but there was no difference in the prevalence between breast feeding and non breast-feeding children. Age may be a confounding variable because younger children have a higher risk for diarrhea and are the most likely to be breast-fed. Therefore, to evaluate the risk of diarrhea among breast-fed and non breast-fed children, the survey would need to control for age. However, the number of children less than 36 months of age represented in the survey would need to be increased substantially to estimate the true diarrhea rates of breast-fed and non breast-fed children.

The percentage of participants meeting the goal of 50 L per capita daily water use was 3% during the baseline study and 1% during the mid-term study. Construction of the water system in Guayabo had not yet been begun at the time of the mid-term survey. This water system will

provide household taps to the people of that community, improving their access to water significantly over the shared wells they now use. The water system in Plan Shalagua was severely damaged at the time of the mid-term survey, and repairs were planned as part of the ARC intervention. However, further assessment during the final survey will be needed to determine if this water system is adequate to meet the needs of the people as defined by the USAID guide.

There was little change in the types and distribution of water sources used in Chiquimula before and after Hurricane Mitch, with roughly equal numbers of households obtaining water from shared spigots and shared wells. During the mid-term survey, the number of households obtaining water from a shared well increased while households obtaining water from a shared spigot decreased. Private spigots provided the greatest volume of water per household, while the least amount of water was collected from rivers or creeks. However, during the baseline survey participants reported collecting the greatest volume of water from shared spigots and the least amount from shared wells and private spigots.

Because the volume of water used might be underestimated in households using private taps to obtain their water because the people might use water straight from their taps and not report it during the survey, a subset of household and shared taps was metered before and during the mid-term survey to check the volume actually used. We found that the measured volume of water used in the houses using private taps was four times the reported volume, and the measured volume in houses using shared spigots was twice the reported volume. These data indicate that people are very likely underestimating the amount of water they use when they obtain water from a private or shared tap.

The distance that people had to travel to obtain water also affected their daily water use. During the mid-term survey, those who had to travel greater than 10 m obtained, on average, only two-thirds the volume of water of those who traveled less than 10 m, and those who traveled greater than 50 m obtained only 60% of the volume collected by those traveling 11 to 50 m. There were no differences in the volume of water collected for those who traveled more than 50 m.

The percentage of child caregivers and food preparers demonstrating appropriate hand washing knowledge and behavior was very low (≤ 12%) in both the baseline and mid-term surveys. At the time of the mid-term survey, the ARC reported that the hygiene education had been completed in Guayabo but only partially completed Plan Shalagua. The hand washing education programs that had been implemented by the time of the mid-term study appeared to have some positive effect on the study population's hand washing behavior. More respondents who reported having had a charla focusing on proper hand washing behavior had passing scores than those who reported not having had a charla. However, the low percentage of people reporting appropriate hand washing knowledge and behavior suggests that ARC should focus on the educational interventions in this study area for the remainder of the project.

Although the question about whether the participant washed her hands after cleaning a baby's bottom was supposed to be scored for all households to include those households where children visit even if they don't live there, this was not clear to all of the interviewers. Therefore some interviewers may not have scored that question at households that did not have children less than

three years of age, although the participants said that they washed their hands at that time. Additionally, requiring participants to recall that they had washed their hands before or after interacting with children may not accurately reflect the knowledge of participants who had no children less than three years of age. Consequently, the scores for participants living in households with no children less than 36 months of age could be inaccurate. To determine if there was an effect, the overall hand washing scores of primary child caregivers and food preparers in households where there were children less than three years of age and where there were no children less than three were compared. Because there were so few child caregivers with passing scores, and only one caregiver without children less than three years of age, these results of this comparison were inclusive. However, more of the food preparers in households with children less than three years of age had a passing score (9%) than the food preparers that did not have children less than three years of age (3%), indicating that the question may not be appropriate for some study participants. Nevertheless, the question was scored identically for all participants regardless of whether or not they had a child less than three years of age, to be consistent with the scoring of the baseline survey and the specifications of the USAID impact indicator.

The population using a hygienic latrine increased at the time of the mid-term survey compared to the baseline survey. The population using any latrine and the number of hygienic latrines that were available to the community also increased at the time of the mid-term survey. However, the percentage of people using hygienic facilities was still well under the goal that at least 75% of the population using a hygienic facility. The ARC interventions in this study area included providing dry pit latrines to all households in both Guayabo and Plan Shalagua. The latrines had been installed and were in use in Guayabo at the time of the survey, but the new latrines were not yet completed in Plan Shalagua at the time of the mid-term survey. With the completion of the latrines, this study area should have adequate access to sanitation facilities.

The educational program focusing on care and use of latrines appears to have had some impact on the behavior of the people of this study area. More of the people who reported having received a charla on the care and use of latrines had hygienic latrines than those who reported not having received such a charla. However, further educational programming on proper care and use of latrines may be necessary in this study area for it to achieve the goal of 75% of the population using hygienic sanitation facilities.

Monitoring Indicators

An ARC goal for this project was that all households in the community would have access to an improved water source following the intervention. The ARC had not completed construction of the new water system in one community in this study area at the time of the mid-term survey, and the upgrading of the water system in the other community had also not yet been completed. However, the percentage of households with access to an improved water source decreased from 40% at the time of the baseline survey to 11% at the time of the mid-term survey. The data suggest that many factors contributed to this decrease in access to an improved water source. Although similar percentages of respondents reported using an improved water source during the baseline and mid-term surveys, more people obtained their water from a shared well during the mid-term survey than the baseline survey, and less people obtained their water from a shared or household spigot. The shared wells are generally located farther from people's homes than the

shared spigots, thus, less people reported using a water source within 200 m of their home during the mid-term survey, which is one of the criteria necessary for determining access to an improved water source. Additionally, the percentage of respondents reporting that their primary water source provided water during the whole year decreased by 50% in the mid-term survey compared to the baseline survey.

The ARC intervention will provide household taps to the people of Guayabo, thus improving their access to water significantly over the shared wells they now use. However, although the water system in Plan Shalagua is being improved as part of the ARC intervention, it may not be adequate to meet the needs of the people as defined by the USAID guide because people may have to travel farther than 200 m to reach the water taps, and some of the taps do not provide water throughout the entire year.

The percentage of households that reported they had access to a sanitation facility decreased from the baseline survey to the mid-term survey. Although at the time of the mid-term survey the ARC had installed latrines at all households in Guayabo and was in the process of installing the latrines in all households in Plan Shalagua, less than 30% of households reported having access to latrines (60% of the study population was from Guayabo, where latrines had been installed). Completion of the installation, and full utilization of all latrines in both Guayabo and Plan Shalagua will increase the access to a sanitation facility in this study area.

Water Quality

The results of the water quality testing performed at the time of the mid-term survey indicated that the majority of the community water sources and the stored water in the households were contaminated with fecal material. Although 26% of respondents living in households where water samples were taken reported treating their stored water on the day of the survey, *E. coli* was detected in 67% of the household water samples. Participants who had received a charla on water storage and treatment were more likely to report having treated their water than those who had not received a charla, however if the treatment was performed it was ineffective in controlling fecal contamination. These results indicate that the community water source should be monitored and treated, and the education program focusing on proper storage and treatment of household water should be continued to improve the quality of the water used by the population of this study area.

Recommendations

This evaluation of the data collected during the mid-term survey and comparison to baseline data revealed areas where ARC should focus attention during the completion of the water and sanitation interventions in Chiquimula.

Water

Water infrastructure does not meet the basic needs of the people living in this study area. The water system in Guayabo is under construction, however, the water infrastructure intervention in Plan Shalagua is complete. The CDC recommends that:

- ARC continue with the development of the water system in Guayabo to provide an adequate water supply to the residents of that community.

- Consider ways to increase access to water in Plan Shalagua.

Sanitation

Construction of sanitation infrastructure is on target to meet USAID guidelines for latrine access. CDC recommends that:

- ARC continue latrine construction program to ensure that latrines are available to the entire population of the study area.
- ARC continue hygiene education programs in Chiquimula to reinforce messages about the proper use and maintenance of latrines.

Hand Washing Behavior

This study area did not meet the USAID goal of a 50% increase in appropriate hand washing knowledge and practice among food preparers and child caregivers. CDC recommends that ARC continue the hygiene education program in Chiquimula to reinforce messages about proper hand washing techniques.

Water Quality Testing

Most of the community water sources and household water tested positive for indicators of fecal contamination.

CDC recommends that ARC:

- Clean and disinfect contaminated community water systems.
- Check that community water storage and distribution systems are in good repair and if they are not take measures to repair them.
- Monitor community water systems regularly for microbial indicators of fecal contamination.
- Continue hygiene education programs in all study areas to reinforce messages about the proper collection and storage of water.

Regional Discussion

The baseline and mid-term surveys assessed the water and sanitation conditions in each study area in the four countries receiving post-Hurricane Mitch water and sanitation assistance using the performance indicators outlined in the USAID guide, "USAID Title II Water and Sanitation Indicators Measurement Guide" (Billig et al., 1999), to assess the impact of the water and sanitation interventions provided by ARC. The data analysis also considered The Sphere Project guideline for water use, which defines a minimum water standard for disaster response of 15 Lpd (Sphere, 1998), as a reference because the interventions were initiated in response to damage caused by Hurricane Mitch and because this guideline provides a bare minimum level of water that should be available to meet the basic needs of people to maintain health and hygiene in an emergency situation.

Comparison of baseline data and mid-term survey data shows that the interventions are improving the health of the populations in the communities receiving the ARC water and sanitation interventions and their access to and use of water and sanitation facilities. The interventions are ongoing and the final survey in February 2002 will clearly define the impact of the interventions on these communities. Nevertheless, significant progress was made toward meeting the project goals in all of the study areas.

The final goal for 2002 is either the static USAID or ARC goal (e.g., 75% of the population using hygienic sanitation facilities) or the difference between the baseline survey results and the USAID defined percentage change from the baseline for each indicator (e.g., 25% decrease in the period prevalence of diarrhea in children <36 months of age in the 2 weeks before to the survey) (Table 4.1). For example, in La Lomas, 27 cases of diarrhea per 100 children were reported in the baseline survey. The USAID goal for the final survey was to reduce the number of cases by 25%, which in this case would mean seven fewer cases of diarrhea, or a goal of 20 or fewer cases of diarrhea to meet the USAID goal. Because the number of cases of diarrhea in children aged <36 months decreased to 15 cases per 100 children during the mid-term survey in Las Lomas, the goal for this indicator was met.

Table 4.1 Comparison of Performance Indicators
Baseline Survey, February 2000, and Mid-term Survey, February 2001

Performance Indicator	USAID Guide[1]	Year of the Study	Honduras		Nicaragua		El Salvador		Guatemala
			Las Lomas	Marcovia	Nueva Segovia	Waspam	Las Pozas	La Ceiba	Chiquimula
Impact Indicator									
Children under <36 months with diarrhea in last 2 weeks[2]	25% decrease from baseline	Baseline 2000	27	29	29	49	40	25	40
		Final Goal (2002)	≤20	≤22	≤22	≤37	≤30	≤19	≤30
		Mid-term 2001	**15**	29	**13**	**31**	46	**16**	**28**
Quantity of water used per capita per day	100% using 50 Lpd[3]	Baseline 2000	27%	29%	16%	0%	21%	6%	3%
		Final Goal (2002)	100%	100%	100%	100%	100%	100%	100%
		Mid-term 2001	27%	50%	21%	1%	17%	6%	1%
Child caregiver with appropriate hand washing behavior	50% increase from baseline	Baseline 2000	18%	19%	33%	19%	20%	28%	12%
		Final Goal (2002)	≥27%	≥29%	≥50%	≥29%	≥30%	≥42%	≥18%
		Mid-term 2001	**47%**	**50%**	30%	**54%**	28%	32%	9%
Food preparer with appropriate hand washing behavior	50% increase from baseline	Baseline 2000	17%	19%	33%	17%	20%	28%	12%
		Final Goal (2002)	≥26%	≥ 29%	≥50%	≥26%	≥30%	≥42%	≥18%
		Mid-term 2001	**40%**	**33%**	29%	**45%**	21%	27%	6%

Population using hygienic sanitation facilities[4]	75% usage	Baseline 2000 Final Goal (2002)	24% ≥75%	15% ≥ 75%	68% ≥75%	13% ≥75%	34% ≥75%	13% ≥75%	15% ≥75%
		Mid-term 2001	**79%**	**77%**	73%	17%	74%	43%	18%
Monitoring Indicators									
Households with year-round access to water[5]	100%[6]	Baseline 2000 Final Goal (2002)	89% 100%	54% 100%	43% 100%	12% 100%	38% 100%	6% 100%	37% 100%
		Mid-term 2001	94%	72%	65%	17%	60%	2%	11%
Households with access to a sanitation facility	100%[6]	Baseline 2000 Final Goal (2002)	64% 100%	27% 100%	96% 100%	21% 100%	50% 100%	18% 100%	43% 100%
		Mid-term 2001	97%	95%	99%	26%	**100%**	51%	29%

1 USAID guide is either a goal or the necessary change in percentage in the population for a specific indicator.
2 Goal is a reduction in the number of cases of diarrhea per 100 children in the study population.
3 Percentage of people that can obtain 50 Lpd of water.
4 A facility is hygienic if there were fewer than 3 flies present and no excreta were found outside the latrine. A latrine was in use if one or more of the following conditions were met: recently cleaned with water, presence of a path to the latrine, signs of recently being swept, signs of recent repair, and no spider webs.
5 Water source is fewer than 200 m away from the household and there is access to water year-round.
6 Goal in not defined in the USAID guide. Goal established by the American Red Cross.
Bold indicates that goal was achieved at the mid-term survey

Impact Indicators

Percentage of Children Under <36 Months with Diarrhea in the Last Two Weeks

During the mid-term survey, five of seven study areas exceeded the goal of a 25% reduction in the 2-week period prevalence of diarrhea in children aged <36 months compared with the baseline survey. Marcovia, Honduras, and Las Pozas, El Salvador, did not meet the goal. All study areas but Marcovia, had not yet completed all parts of the infrastructure or education programming at the time of the mid-term survey. Although the ARC water and sanitation infrastructure construction and hygiene educational program in Marcovia was completed before the mid-term study began, this community did not meet the USAID target for decreasing diarrheal prevalence. However, site-specific factors probably contributed to the lack of change in the prevalence of diarrhea in children aged <36 months in Marcovia. The chlorination system on the water tank was not yet operational, the community water board turned on the water pump for a limited time each day to control consumption of electricity, and other segments of the resettlement community where other non-governmental organizations (NGOs) were working were not providing hygiene education. Overall, the ARC interventions that provided improved access to high-quality water and sanitation facilities, coupled with hygiene education programs successfully decreased the prevalence of diarrhea in young children in these communities.

Quantity of Water Used Per Capita Per Day

The USAID guide recommends that people be able to collect or have delivered directly to the home 50 Lpd of water for drinking, cooking, bathing, personal and household hygiene, and sanitation. The USAID goal states that 100% of the population should be able to obtain the recommended volume of water. However, the target volume may need to be adjusted to account for local conditions and customs.

None of the study areas reached the goal of 100% of families collecting the USAID recommended 50 Lpd at the time of the baseline or mid-term surveys (Figure 4.1). Construction of improved access to potable water sources had been completed in three study areas by the mid-term survey; four others were under construction. However, none of the study areas is likely to

achieve the goal of 100% of households collecting 50 Lpd, even after improved water systems are in place in all communities. In Waspam, the communities are located along a river that provides much of the community's non-potable water needs. In the other communities, the people's pattern of use, compared with the amount of water collected for each use, needs to be studied more closely to determine whether 50 Lpd is the appropriate goal for these communities.

People in the two study areas in Honduras collected an average of 50 Lpd. All other study areas collected, on average, fewer than 50 Lpd. During the mid-term survey, all study areas met an average of 15 Lpd except for Waspam, Nicaragua, and Chiquimula, Guatemala.

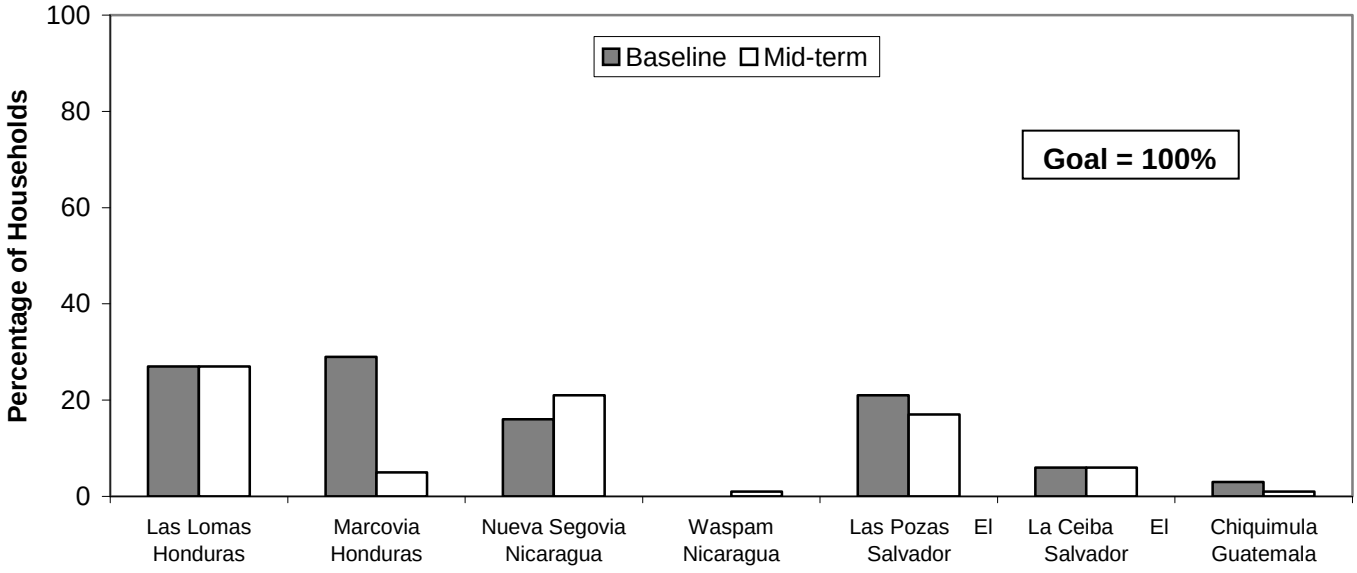

Figure 4.1 Percentage of Households Meeting the USAID Water-Use Goal by Study Area-50 Lpd, Baseline Survey, February 2000, and Mid-term Survey, February 2001

Percentage of Child Caregivers and Food Preparers with Appropriate Hand Washing Behavior

Hand washing knowledge and behavior can be improved through community health education programs. Hand washing disrupts fecal-oral transmission of disease and is strongly associated with decreased diarrhea rates. The USAID goal is to improve indicators of appropriate hand washing behavior by 50%. Las Lomas and Marcovia, Honduras, and Waspam, Nicaragua, met the 50% increase in proper hand washing behavior in both the child caregiver and the food preparer during the mid-term survey, compared with the baseline survey (Table 4.1). Each of these study areas had completed its hygiene education program by the mid-term survey. The hygiene education programs in the four study areas that did not meet the goal for this indicator were in various stages of completion at the time of the mid-term survey.

Percentage of Population Using Hygienic Sanitation Facilities

To have the maximum health impact, USAID guidelines call for at least 75% of the population to have and use a hygienic sanitation facility, i.e., a toilet or latrine (Billig et al., 1999). This indicator calls for not only access to latrines but also demonstrated use and hygienic conditions. Las Lomas and Marcovia, Honduras, the two study communities in which ARC latrine projects and educational programming were fully implemented at the mid-term survey, met the 75% rate of use of hygienic latrines during the mid-term survey. Nueva Segovia, Nicaragua, and Las Pozas and La Ceiba, El Salvador, all came within a few percentage points of the 75% goal for use of hygienic facilities. In Nueva Segovia, latrines were planned and had been built in part of the community; the latrine projects were nearly complete in both of the study areas in El Salvador but were slightly damaged during the earthquakes in January and February 2001. The use of hygienic facilities in Waspam, Nicaragua, and Chiquimula, Guatemala, was three to four times lower than the goal at the time of the mid-term survey. The ARC latrine interventions in these study areas were still under way at the mid-term survey. These data demonstrate the positive impact of the ARC latrine interventions and education focusing on care and use of latrines on the use of hygienic latrines in these communities.

Monitoring Indicators

Percentage of Households with Year-round Access to Water

Year-round access to an improved water source is defined as access to an adequate water source located within 200 m of the household. To be considered "adequate," the water source must be a protected shared or private well or spring or a treated surface water source but not an untreated surface water source such as a river. The Title II guide also states that the household should not have to "spend a disproportionate part of their day" to obtain water by waiting in a long line or by collecting water from a source with an inadequate flow rate. To ensure access to a sufficient quantity of water, public water collection points should be located so at least one water collection point is available per 250 people, and the maximum distance from any household to a water collection point is less than 500 m. The USAID guideline did not define a goal for this indicator. However, ARC established a goal of 100% of the population having access to an improved water source in communities where ARC implemented a water intervention.

In Las Lomas and Marcovia, Honduras, 94% and 98% of households, respectively, had access to an improved water source as defined in the Title II guide. The water intervention was complete in Marcovia and nearly complete in Las Lomas at the mid-term survey. In the other study areas, the water systems were in various stages of construction at the mid-term survey, and 65% or fewer of people had access to an improved water source. The ARC goal of providing the target communities with 100% access to an improved water source may not be reached in many of the communities because there are people who decided not to participate in the intervention or chose not to move into the communities. By providing greater than 98% of the population with access to an improved water source in the study area where the water intervention was complete, ARC achieved excellent coverage of the target population.

Percentage of Households with Access to a Sanitation Facility

The USAID guideline did not define a goal for access to a sanitation facility. However, the ARC established a goal of 100% of the population having access to a sanitation facility. According to the Title II guide, a sanitation facility can be either private or shared and is considered accessible if it is available to a household, regardless of whether it is used. Las Pozas, El Salvador, met the 100% goal set by ARC at the mid-term survey, and Las Lomas and Marcovia, Honduras, and Nueva Segovia, Nicaragua, provided 95% or greater availability of latrines. The latrine interventions had been completed in these communities at the mid-term survey. Again, the goal of 100% coverage was not fully met in some of these communities because some of the households had not yet moved in or had decided not to participate in the intervention. However, 95% coverage of the target population with access to sanitation is excellent progress toward the goal and achievement of the purpose of the intervention.

Access to latrines in Waspam, Nicaragua; La Ceiba, El Salvador; and Chiquimula, Guatemala, in which household latrines were under construction at the mid-term survey, was two to four times lower than the goal of 100%. ARC planned to construct household latrines in Waspam; however, only two school-based latrines had been constructed in Kum and several existing community latrines were in use in Andres at the mid-term survey.

In future interventions, ARC may need to revise the goals for the monitoring indicators for access to an improved water source and to a latrine to more realistic levels (e.g., 90%-95%), taking into account social (e.g., refusal to take part, mobility) and technical (e.g., ground too hard to dig a pit) constraints.

Water Quality Testing

A high percentage of both household and community source waters were contaminated with total coliforms and *E. coli* (Table 4.2)

Table 4.2 Summary of Microbial Analysis of Water Samples for All Study Areas, Baseline Survey, February 2000, and Mid-term Survey, February 2001

Water Source	Honduras				Nicaragua				El Salvador				Guatemala	
	Las Lomas		Marcovia		Nueva Segovia		Waspam		Las Pozas		La Ceiba		Chiquimula	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Community source	+/+	+/+	- / -	+/+	+ / +	+/+	+ / +	+/+	+/+	+/+	+ / +	+/+	+ / +	+/+
Household	+/+	+/+	+ / +	+/+	+ / +	+/+	+/ +	+/+	+/+	+/+	+ / +	+/+	- / +	+/+

Results are for total coliform bacteria / *E. coli*

\+ Positive results are indicated if any of the samples for that study area tested positive.

\- Negative results are indicated if every sample for that study area tested negative.

Most of the water samples taken during the baseline survey were sent to in-country laboratories for analysis, and a variety of analytical techniques were used to determine whether water samples were contaminated with fecal coliform bacteria. Water samples taken during the mid-term survey were processed and analyzed using the portable DelAgua water testing kit, and the number of total coliform bacteria and *E. coli* in each water sample were quantified. Results of the baseline and mid-term surveys could not be compared quantitatively. However, on a qualitative basis, both community and household water samples in all study areas were contaminated with these microbial indicators of fecal pollution during both the baseline and the mid-term surveys. During the final year of the study, the DelAgua test kit will be used for quantitative microbial analysis so the results can be confidently compared with those of the mid-term survey.

The use of contaminated water for drinking, washing, and household chores may have affected the diarrheal rates in children aged <36 months in all of the study areas. Periodic testing, cleaning, and disinfection of the wells (if applicable) and tanks will be essential to maintain the integrity of the community water sources after the completion of the interventions. Ongoing education focusing on proper storage and treatment of water is necessary to reinforce messages about the impact of these practices on health, to promote an increase in the quality of the drinking water that people in these communities store in their homes.

Regional Recommendations

As part of the survey in each community, the community leaders were asked to identify the primary community need during both the baseline and mid-term surveys (Table 5.1).

Impact Indicators

Diarrheal Disease Prevalence

The goal for decreasing diarrheal disease prevalence among children aged <36 months was met in five of seven communities. To ensure continued improvement, CDC recommends that ARC emphasize messages about the risk factors for waterborne diarrheal disease and measures for reducing water contamination in their hygiene-education program. Additionally, ARC should provide disinfection facilities for water systems, where appropriate.

Water Use

The water system infrastructure does not meet the basic needs of some communities, as defined by the USAID Title II guidelines. Even after the water supply interventions are in place, households in these communities may not be able to meet the goal of 50 Lpd water use. This is particularly true for Waspam where the communities are located along the Rio Coco and use the river for daily non-potable water and generally not store water in the home. The people of Waspam need to obtain drinking water from ARC wells that are free from microbial contamination.

CDC recommends that all communities except Waspam (where shared wells will be provided) be provided private or shared spigots to increase the volume of water the population can realistically collect and to reduce the distance people have to travel to their primary water source. If water flow is adequate, per capita daily water use should increase in these communities. CDC recommends that ARC reevaluate per capita water use after all systems become operational to

Table 5.1 Community Needs, Planned Interventions, and Recommendations
Mid-term Survey, February 2001

Country/ Study Area	Perceived Community Need	Planned Intervention	Status of Intervention as of February 2001	Recommendation by CDC
Honduras				
Las Lomas	Potable water	• Upgrade water system with new tank, additional household connections ♦Household latrines + Education program-hygiene, water use, and sanitation	• Water system designed but not fully constructed; water committee established ♦Latrine construction complete + Education program on hygiene, water and sanitation done by ARC and Honduran Red Cross	• Check water system piping for leaks; disinfect contents of water tank ♦ Verify latrine access and full coverage + Continue with health education on hygiene, water use and treatment, and sanitation
Marcovia	Water and sanitation	• Construct new water system-spigots ♦Household latrines + Education program-hygiene, care and use of latrines	• Completed; chlorinator not yet installed ♦Latrine construction complete + Education program on hygiene, water and sanitation done by ARC and Honduran and Swiss Red Cross	• Disinfect community water source ♦Verify latrine access and full coverage + Continue with health education program on water, hygiene, sanitation
Nicaragua				
Nueva Segovia	Reconstruction of damaged water system	• More household/shared spigots ♦Improve access to latrines + Education program-hygiene, water use, sanitation	• Two water systems installed in different parts of community, one by municipality and one by ARC ♦Construction in one part of community + Hygiene, water, and sanitation education started in Jan 2001 by ARC	• Complete water intervention to improve access ♦Complete latrine construction + Continue with health education, especially focusing on hygiene and sanitation messages

Waspam	Andres: Latrines	• Install 3 new wells ♦Construct household latrines + Education program-hygiene, water use, and sanitation	• Not yet constructed ♦Household latrines under construction + Hygiene and sanitation education programs completed and ongoing by other NGOs	• Complete well construction to improve access and provide adequate water ♦Complete latrine construction for better access + Continue with health education, water, hygiene, and sanitation; collect clinic data on diarrhea for comparison with active surveillance of diarrhea
	Kum: Better health center	• Install 7 new wells ♦Construct shared (school) latrines and household latrines + Education program-care and use of latrines	• Built 3 wells ♦Built 2 school latrines; household latrines under construction + Hygiene and sanitation education completed and ongoing by ARC	• Complete water intervention to improve access ♦Complete household latrines to improve access and coverage + Collect clinic data on diarrhea for comparison with active surveillance data

Table 5.1 Community Needs, Planned Interventions, and Recommendations (continued)

Country/ Study Area	Perceived Community Need	Planned Intervention	Status of Intervention as of February 2001	Recommendation By CDC
El Salvador				
Las Pozas	Employment opportunities	• Construct water system ♦More household latrines + Education program-hygiene	• Water storage tanks installed by CARE, 80% complete; water committee established ♦Latrines under construction, some damage by Jan and Feb 2001 earthquake + Hygiene and sanitation education 90% complete by ARC and CARE	• Check on completion of water intervention for better access ♦Complete latrine intervention to improve access + Continue education, health (diarrhea), hand washing, latrine care and use; provide soap and chlorine for good hygiene
La Ceiba	Water and better roads	• Construct new water system ♦Household latrines + Education program-hygiene, water use, and sanitation	• Community tap completed; water tanks completed-some earthquake damage; water and health committee established ♦Latrine construction 80% complete + Hygiene education program started in June 2000 by ARC	• Complete system to improve access to water; monitor, and test tanks ♦ Complete latrine intervention to improve access + Continue education, health (diarrhea), hand washing, latrine care and use; provide soap and chlorine for good hygiene
Guatemala				

Chiquimula	Plan Shalagua: Improve water system	• Upgrade water system ♦ Household latrines + Education program-hygiene, water use, and sanitation	• Water system improved; water meters in some homes; water committee established ♦ Latrines under construction + 1/3 of people have had hygiene and latrine education by ARC	• Increase access to water; clean and disinfect community water system and monitor ♦Verify coverage of entire population with ARC latrine program + Continue hand washing, water use, and sanitation education
	Guayabo: Improve water system	• Construct a new water system - household taps ♦Household latrines + Education program-hygiene, water use, and sanitation	• Water system planned; water committee established ♦Latrine construction complete + Education by ARC on hygiene and latrine construction and maintenance	• Develop water system for better access to water supply; clean, disinfect, and monitor community water system ♦Verify coverage of entire population with ARC latrine program + Continue hand washing, water use, and sanitation education

determine whether 50 Lpd is an appropriate water use goal for these communities and to evaluate community water management practices and their impact on per capita water use.

Hygiene-education programs should be continued in all study areas to reinforce messages about the proper collection and storage of water.

Hand Washing Behavior

CDC recommends that ARC continue hygiene-education programs in all study areas to reinforce messages about proper hand washing techniques. Hand washing behaviors also are encouraged by placing hand washing facilities near sanitation facilities and by providing a sufficient amount of water. These issues should be addressed in the study areas being provided with household latrines and household spigots.

Sanitation Facilities

The planned intervention for all communities focuses on building household latrines with access for most of the population. The minimum sanitation standards set by the Sphere Project (Sphere, 1998) include

1. a maximum of 20 people per toilet;
2. arranging toilet use by household or segregating toilets according to people's sex;
3. locating toilets no more than 50 m or 1 minute's walk from dwellings; and
4. having public toilets available in public places.

The sanitation interventions should be completed in the study areas where they are still under construction. Hygiene-education programs in all study areas should be continued to reinforce messages about the proper use and maintenance of latrines.

Water Quality and Testing

Contamination of community and household water sources remains problematic in all study communities. CDC recommends that ARC clean and disinfect the community water systems that were found to be contaminated during the mid-term survey. ARC should determine whether community water storage and distribution systems are in good repair and, if they are not, repair them. A monitoring program initiated by the ARC should begin in all study areas for measuring microbial indicators of fecal contamination.

CDC qualitatively compared the results of the water quality analyses performed during the baseline and mid-term surveys. Most community and household samples tested positive for total coliform bacteria and *E. coli*. The DelAgua water testing kit proved to be a useful tool in the field during the mid-term survey and resulted in collection of reliable data. CDC recommends using the DelAgua portable water testing kits again for the final survey. The PurTest kit was useful as a confirmatory test but was not suitable for traveling and often leaked in transit. An alternate but similar test kit should be used in the final survey to confirm the DelAgua test results. If feasible, additional water samples should be sent to in-country laboratories for additional confirmation of the DelAgua test results.

Additional regional recommendations include

1. Complete the mid-term survey in Huitzitzil, Guatemala.
2. Continue with plans to complete the final evaluations in all study areas in February 2002.

Limitations

Every study design has limitations and recognizing these limitations is important to assist in interpretation of data and to improve future data collection efforts (e.g., during the final year of data collection). Limitations have been identified for the methodologies used in estimating water consumption and evaluating knowledge of appropriate hand washing behaviors.

Water Use

Water use in the participating households was estimated on the basis of self-reported use of water collected and stored in culturally specific water containers. Water meters were installed and data were collected during the mid-term survey on a subset of household taps in each community (where appropriate) to provide an accurate measure of the amount of water used in each home or group of homes that used household spigots as their primary source of water.

Results of the water meter data collection showed no association with the self-reported data. The discrepancies between the data sets varied markedly among the study areas, and no systematic error could be identified. However, some of the meters and distribution system pipes leaked and some households watered cattle from their household spigots. Thus, the discrepancy between the metered and reported volumes is difficult to fully assess without further evaluation of the community water use patterns and the water-distribution systems.

Hand Washing Behavior

People living in households without children are less likely to report hand washing activity before or after interaction with children. However, no differences in scoring were made to account for the fact that people who do not live with young children would be less likely to think of these answers than those living with young children. The USAID indicators rely on the interviewees to spontaneously recite the times they wash their hands. Two USAID indicators refer to hand washing activities specific to child care:

1. washing hands after cleaning a child's bottom and
2. washing hands before feeding children.

The USAID guideline did not provide guidance on differentiating these results for the primary child caregiver and food preparer. During future analyses, hand washing scores of the households without children may need adjustment to account for these differences in responses associated with child care.

Conclusion

At the mid-term survey, many of the interventions were under construction or had just been completed. However, the programming interventions appeared to be on target to meet USAID guidelines. During this intermediate stage of the intervention process, some of the study areas were already meeting the goals set for many of the impact indicators. Notably, five of seven study areas met the goal for reduction in diarrhea prevalence in children aged <36 months.

The stringent goals set for the monitoring indicators (100% access to improved water source and a sanitation facility) were not met, except in Las Pozas, where 100% of the households reported having access to sanitation facilities. However, in three other study areas, greater than 95% of households had access to a sanitation facility, and in two study areas, greater than 94% of households had access to an improved water source.

None of the study areas is likely to achieve the goal of 100% of households collecting 50 Lpd of water, even after improved water systems are in place in all communities. Patterns of use should be studied more closely to determine whether 50 Lpd is an appropriate water use goal for these communities.

Some programs appeared to be more successful than others in increasing the knowledge and practice of proper hand washing behavior of child caregivers and food preparers. However, most of the education campaigns in the study communities were not complete at the mid-term survey, which may have affected the effectiveness of the programs. During the final survey, the hygiene messages and dissemination techniques will be compared to determine whether differences in the education programs affected the retention of appropriate hand washing knowledge and behavior.

A baseline evaluation was conducted for Huitzitzil, Study Area 2 in Guatemala and will be submitted as an addendum to this report. Continuity of study coordinators, interviewers, study instruments and consistent laboratory methods will help reduce the variability between the two datasets.

The final collection of data in February 2002 and the subsequent comparison with the baseline and mid-term data will allow an evaluation of the sustainability of the interventions in terms of improved health of the community and maintenance of the water and sanitation interventions.

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