12-20-2012

Perceptions of Water, Sanitation and Hygiene Interventions in Select Communities in Central America. Recommendations to Explore the Issue of Sustainability

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A Thesis Submitted to the Graduate Faculty of Georgia State University in Partial Fulfillment of the Requirements for the Degree

Master of Public Health

Atlanta, GA 30303

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ACKNOWLEDGEMENTS

This research project would not have been possible without the support of many people. I have to begin with thanking god from whom I have received strength, endless love and confidence to succeed in all my endeavors. I would like to express my deepest gratitude to my Chair and also adviser Dr. Christine Stauber for her invaluable assistance, support and guidance in developing this project and for helping me to set and achieve my academic goals during the past two years. My gratitude is also due to Dr. Kim Ramsey-White for her willingness to help and provide me with invaluable suggestions to improve this work. I would also like to thank Dr. Bobbie Person in Malawi, without whose knowledge this study would not have been successful. I'm fortunate to have had access to her wisdom, criticism and expertise in qualitative research. My deepest thanks to the members of the Global water, sanitation and hygiene team at the Centers for Disease Control and Prevention (CDC), for allowing me to carry out this project. In particular, I would like to express my sincere gratitude to Raquel Sabogal for her mentorship and assistance when I worked with her and throughout the development of this research. I am very grateful for her trust and for promptly providing the answers to all the questions I had about this study. Finally, I would like to express my love and gratitude to my mom in Colombia for her endless love, blessings and encouragement when it was most required and to my beloved husband for his incredible, never ceasing patience and support throughout the duration of my studies.

To all of you my deepest thanks…

ABSTRACT

ARLYN NATHALIA GLEATON

Perceptions of Water, Sanitation and Hygiene Interventions in Select Communities in Central America. Recommendations to Explore the Issue of Sustainability

Background: Estimations from the Joint Monitoring program for Water Supply and Sanitation (JMP, 2012) reveal that "less than five percent of water and sanitation interventions are revisited once they have been completed and less than one percent are monitored over the long term". Since 2000, the Centers for Disease Control and Prevention(CDC) has been working with the American Red Cross (ARC) to evaluate the long-term sustainability of post-disaster water, sanitation and hygiene interventions (WASH) provided in Guatemala, Honduras, Nicaragua and El Salvador. Sustainability assessments were conducted in 2006, 2009 and most recently in 2012. In the 2012 evaluation, a qualitative approached was included to extent the results obtained from quantitative surveys through an exploration of individual perceptions and current practices.

Methodology: Key-informant interviews were conducted with the heads of household in 15 communities purposively selected. All interviews were recorded, transcribed, coded and analyzed using the computer assisted qualitative data analysis software MAXQDA10

Results: Interviewees discussed issues related to the quality, safety and adequacy of the water and sanitation infrastructure and hygiene education sessions received. Issues of corruption in the water committees and delayed repair of damaged infrastructure resulting in erratic service were frequently reported. In addition, lack of financial support, community engagement, and equity were identified by heads of household as major limitations to sustain and improve WASH interventions.

Conclusions: This exploration provides valuable information to further examine the factors driving people's adoption of hygienic practices and maintenance of water and sanitation facilities in the Central American region.

Index Words: Central America , water, sanitation, hygiene education, sustainability perceptions, WASH programs

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Work Experience

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Guest Researcher

Conducted qualitative research on data collected from four countries in Central America. Developed two databases to support statistical analysis of quantitative research surveys. Conducted a literature review in Water, Hygiene and Sanitation interventions to support research findings. Presented research findings in reports and oral presentations to CDC staff members. Prepared recommendations for the improvement of policy and sustainability of water, sanitation and hygiene programs regionally and globally.

Georgia State University -Institute of Public Health. Center of Excellence and Health Disparities Research (CoEx). Atlanta, GA. January 2011 – December 2012.

Graduate research assistant
Community Project: Accountable Communities Healthy Together-Asthma Program

Planned, organized, conducted and coordinated different program activities such as health education sessions for children with asthma and their caregivers (216 participants), health fairs,

and information dissemination sessions in schools and community-based organizations.Established and maintained cooperative and effective relationships with community partners such as Community Based organizations serving different populations (Caucasian, Hispanic and African American); Health coalitions, Educational and Religious institutions, and local community centers.Scheduled, organized and conducted in-home environmental assessments and interventions. Trained 5 graduate students, 2 staff members and 2 community health workers in evidence-based asthma management and environmental assessment. Assisted in the development of a database with 413 variables in Epi-info. Assisted in the design and development of IRB protocols, surveys and educational materials in English and Spanish.

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CHAPTER I

INTRODUCTION

1.1 Background

Between 1990 and 2010 significant progress was made to achieve the Millennium Development Goal 7, target 7c (MDG 7, 7.c): "To halve by 2015 the proportion of the population without sustainable access to safe drinking water and basic sanitation". Despite this progress, approximately 118 million people in Latin America and the Caribbean were still living without sanitation, and 35 million did not have access to an improved source of water by 2010 (WHO/UNICEF,2012). Furthermore, barriers and limitations such as lack of political commitment, scarcity of financial resources, constraints to extend equal coverage within communities and regions, adverse environmental events, and socio-cultural inadequacy have limited expansion and threaten the sustainability of Water, Sanitation and Hygiene (WASH) achievements post-2015 (WHO/UN, 2012).

Since MDG 7 was established, Latin America, in particular the Central American region has been severely impacted by a number of natural disasters such as hurricanes and earthquakes. One of the deadliest and costliest hurricanes in the story of Central America was hurricane Mitch in 1998 (GAO, 2001). This hurricane caused more than 10,000 deaths and left more than 3 million people without water supply and access to basic sanitation in Honduras, Nicaragua, Guatemala, El Salvador, and Costa Rica and Belize to a lesser extent (PAHO, 1998). As a consequence of displacement and damage in water and sanitation infrastructure, populations affected become more vulnerable to outbreaks of communicable disease such as diarrheal

disease, cholera and dysentery (Atuyambe el al. 2011). Immediately after Hurricane Mitch, the American Red Cross (ARC) provided WASH interventions in Nicaragua, Honduras, Guatemala, and El Salvador (Moll et al, 2007). More than 100 communities received drinking water supply systems, latrines, and education in safe hygiene practices. The effectiveness of these interventions was evaluated by the Centers for Disease Control and Prevention (CDC) in 2002. Results from this evaluation showed a 26% reduction in the prevalence of diarrheal disease in children younger than 3 years of age due to the integration of improved access to water, sanitation and hygiene education (Moll et al. 2006). Furthermore, the findings and recommendations from the 2002 health study raised the question of sustainability (CDC, 2002). Consequently, two follow-up assessments were conducted in 2006 and 2009. Results from both assessments showed continuity in the community benefits arisen from the WASH interventions provided by ARC (CDC, 2009). In addition, CDC recommended that ARC should reinforce health education to ensure maintenance and proper use of water and sanitation infrastructure and sustainability of hygiene behaviors (CDC, 2009).

In 2012, a long-term assessment carried out to the 10-year mark was performed. In the 2012 assessment, 277 household surveys, 15 community surveys, 15 infrastructure surveys, and 30 key informant interviews from 15 communities in the four countries were conducted. In-depth interviews were included in this assessment with the purpose of extending the findings from the quantitative evaluations and identifying themes for further exploration on the existence of social, cultural and contextual facilitators and barriers affecting the sustainability of WASH programs in Central America.

1.2 Purpose of Study and Research Questions

Despite the occurrence and complexity of adverse environmental events, morbidity and mortality due to gastrointestinal disease can be substantially reduced when appropriate water, sanitation and hygiene (WASH) interventions are provided (Atuyambe et al. 2011, Caincross et al. 2010). Moreover, these interventions must be sufficient, adequate and sustainable to ensure long-lasting effects on populations' health (World Bank, 2011; WHO/UN, 2012). Therefore, the purpose of this research is 1) To explore individual experiences, insights and challenges related to WASH activities undertaken by ARC in select communities in Central America, and 2) Identify key themes raised by study participants in relation to the sustainability of water, sanitation and hygiene education and provide a foundation for further exploration of community issues and priorities.

Organizing individual opinions into core themes will help to create a framework for the development of future research in the sustainability of WASH programs. In addition, supplementing a large quantitative dataset with the ideas and issues identified by key informants will be helpful to provide ARC and other international and local organizations with suggestions and recommendations for the development of improved plans and strategies that lead to sustainable WASH programs in the Central American region.

CHAPTER II

REVIEW OF THE LITERATURE

The 2015 target of the Millennium Development Goals- Goal 7 is to "reduce by half the proportion of people without *sustainable* access to safe drinking water and basic sanitation" (UN, 2010). In order to achieve this goal, a number of WASH programs lead by international and/or local organizations have been provided in the Central American region, including the American Red Cross WASH interventions post-hurricane Mitch provided in 110 communities in Guatemala, Honduras, Nicaragua and el Salvador. Traditionally, information about the effectiveness of these interventions is thoroughly analyzed. However, further information about the longevity of the health-effects, integrity and use of water and sanitation infrastructure is limited (WHO, 2012). In addition, issues surrounding adoption of preventive behaviors such as appropriate hand washing, point-of-source water treatment and good hygiene practices have contributed to reappearance of diarrheal disease in populations where disease rates had already been controlled (Levine et al, 2012). Thus, understanding these issues is critical to establish the foundation for the design and implementation of WASH programs tailored to socio-cultural and contextual aspects in the populations served, optimize allocation of resources during post-disaster events and ensure long-lasting development projects that will result in sustainable benefits in communities' health.

2.1 Overview of the Central American region- Guatemala, Honduras, El Salvador and Nicaragua:

This study was conducted in selected communities in four Central American countries: Guatemala, Honduras, El Salvador and Nicaragua. The total population in Guatemala in 2009

was more than 14 million people, almost doubling the populations in Honduras (7.6 million), El Salvador (6.36 million) and Nicaragua (5.8 million). The official language in the four countries is Spanish and more than 23 Amerindian languages originated in the Mayan, Garifuna and Xinca cultures have been recognized. According to the World Bank, between 35% and 50.5% of the total population in the four countries live in rural areas, although temporary or permanent migration to urban centers or neighboring countries for work remains a common pattern. Generally speaking, rural areas in Central America bear the largest burden of poverty and unemployment (World Bank, 2011). On average, literacy rates are 78% and 83% in women and men 15 years and older respectively (UNICEF,2012). However, in rural settlements or communities, most students leave school at an early age to seek for jobs in construction or agriculture on family-farms (World Bank, 2012). In El Salvador, 5% of population live below the poverty line, a trend that has been improving over time due to substantial increase in economic development. In contrast, It has been estimated that approximately 16-23% of the total population in Honduras, Guatemala and Nicaragua live in extreme poverty (UNICEF,2012). This is further aggravated by the vulnerability of the Central American region to catastrophic events such as floods, earthquakes, hurricanes, volcanic eruptions and seasonal drought that had led to instability, loss of infrastructure, limited access to resources and displacement. Continuous exposure to these events not only has increased poverty, but also had limited access to basic sanitation while increasing water pollution and water demand (Da Costa Silva, 2011). Table 1 shows the proportion of the rural population that had access to sanitation facilities and an improved source of water by 2010 in the four countries included in this study.

Table 1. Access to water and sanitation (adapted from WHO, 2010)

Country	Access to basic sanitation %	Access to an improved source of water %
Guatemala	70	87
Honduras	69	79
El Salvador	83	76
Nicaragua	**37**	**68**

Access to improved water and sanitation in Central American countries seems to be strongly influenced by a combination of environmental and socio-political factors (Da Costa, 2011). An in-depth understanding of these factors from the perspective of the populations directly affected is necessary to address WASH sustainability.

2.2 The Centers for Disease Control and Prevention's Central America Water and Sanitation Sustainability Project

Since 2000, The Centers for Disease Control and Prevention (CDC) has been collaborating with the American Red Cross (ARC) to evaluate the public health impact of water, sanitation and hygiene (WASH) interventions provided in Guatemala, Honduras, Nicaragua and El Salvador in response to Hurricane Mitch, which struck Central America in October 1998. ARCs' WASH interventions were provided to improve the health of the communities affected by the hurricane and prevent the spread of diarrheal disease by providing sustainable access to water and basic sanitation as well as education in hand washing and hygiene practices (Moll et al, 2007). Research has shown that improvements in drinking water, sanitation and hygiene behavior provided independently or combined, contribute to reduce the burden and risks of

diarrheal disease (Esrey et al, 1990; Pruss et al, 2002; Fewtrell, 2005; Caincross et al 2010). The interventions provided by ARC were developed based on financial feasibility, existing resources in the communities and residents' willingness and ability to accept and support the services offered. One evaluation of effectiveness and three sustainability assessments of ARC's interventions have been conducted by CDC between 2000 and 2012.

In the 2000-2002 evaluation, ten communities were selected to assess the effectiveness of ARC's WASH interventions. Then, the first and second sustainability assessments were performed in 2006 and 2009 including the same communities surveyed in 2002. In the 2006 assessment Huitzitzil, Guatemala and Waspam, Nicaragua were not included, because their water and sanitation systems had not been fully-funded or maintained using ARC resources (CDC, 2010). In the third sustainability assessment conducted in February 2012, seven additional communities were included to achieve the desired sample size recommended by Guest et al. in 2006 for multi-level studies where individuals are nested within groups (communities) and qualitative studies based on opinions and perceptions, respectively (Creswell, 1998). Table 2 lists the communities participating between 2000 and 2012 and the WASH interventions provided by ARC in each of them.

2.2.1 Results from the 2002 effectiveness assessment

The purpose of this assessment was to evaluate the achievement of ARC's goals by comparing baseline data (2000) and data collected in 2002 once the interventions were completed (Moll et al, 2007). Four impact and four monitoring indicators established by The United States Agency for International Development (USAID) Food and Nutrition Technical Assistance Project (FANTA) (Billing et al, 1999) were measured as requested by ARC. These

guidelines provide a set of indicators that are specifically related to disaster-related water and sanitation programs and their use is encouraged to obtain standardized and homogeneous information among projects funded by USAID (Billing et al. 1999). A list of these indicators and the results obtained from CDC's evaluation of ARC's interventions is provided in table 3. Overall, ARC's WASH interventions met the regional goal of reducing diarrhea prevalence as indicated by the health impact indicator of diarrhea in children < 3 years of age. A 26% reduction in prevalence of diarrhea was observed after comparing baseline and final data. Although most of ARC's goals were achieved, this study was limited in its ability to measure the long-term impact of the interventions provided. In some communities, the projects have been operating only for one year by the time the evaluation was conducted. Therefore, evaluating sustainability was not possible (Moll et al, 2008).

2.2.2 The 2006 and 2009 sustainability assessments

The goal of these two assessments was to evaluate the sustainability of ARC's interventions in two follow-up periods after the initial assessment of effectiveness completed in 2002. Overall, ARC WASH interventions were sustainable after four and seven years. However, hygiene behavior-based interventions such as hand washing and maintenance of latrines were less sustainable than physical infrastructure interventions such as water systems and sanitation facilities (CDC, 2008 and 2010). Several factors influencing these trends were identified in the 2006 assessment and persisted during 2009. A summary of these factors is provided in table 4 along with results from the indicators evaluated in both follow-up assessments. Overall, both sustainability assessments revealed the need of financial support and technical assistance to maintain and repair water and sanitation systems' infrastructure, which is frequently disrupted due to seasonal damage.

Table 2. Communities studied and interventions provided by ARC

Country/study area	Size of community	Type of community	Intervention	Surveyed			
				2002	2006	2009	2012
Guatemala							
Colonia Mitch	175 households 1050 beneficiaries	Peri-urban existing community	Shallow well, electric pump One latrine/household Sewage system being installed by municipality ARC Education*	No	No	No	✓
El Guayabo/Filincas	180 households 1545 beneficiaries	Rural; existing mountain communities	New water system-spring-fed gravity flow system to household taps. Filincas also draws from same system. Household VIP latrines ARC Education*	✓	✓	✓	✓
Plan Shalagua	300 households 1800 beneficiaries	Rural; existing mountain community	Upgrade water system-spring-fed, gravity flow system to household taps Household VIP latrines ARC Education*	✓	✓	✓	✓
Santiago Abajo / Manzanotal	116 households 550 beneficiaries	Peri-urban community	River water source, gravity flow to household taps (2001) Household latrines by ARC ARC Education*	No	No	No	✓
Huitzil	320 housholds	Rural; existing community on coast	No water intervention planned Household composting latrines	✓	No	✓	No

Country/study area	Size of community	Type of community	Intervention	Surveyed			
				2002	2006	2009	2012
Honduras							
Ciudad España	1365 households (connected) 9600 beneficiaries	Peri-urban community	Water sources are 2 springs and 3 deep wells, gravity and electric pump, with infiltration galleries. Use deep wells during the dry season. Sewage system and wastewater treatment plant installed by the project ARC Education*	No	No	No	✓
Colonia Cruz Roja	428 households (connected) 2784 beneficiaries	Peri-urban community	Deep well, submergible pump plus booster pumping station (electric). Sewage system with wastewater treatment plant ARC Education*	No	No	No	✓
Las Lomas	500 households 1140 beneficiaries	Peri-urban; existing community in hilly region	Upgrade water system-new tank and source, additional connections-spring-fed, gravity flow system to household taps Household pour/flush latrines Sewage system (2010) only 10% coverage, poor functionality ARC Education*	✓	✓	✓	✓
Marcovia	245 households 1440 beneficiaries	Peri-urban; resettlement community in flood plain	New water system-deep drilled well, pump, to tank (electric), gravity flow to household taps Household pour/flush latrines ARC Education	✓	✓	✓	✓

Country/study area	Size of community	Type of community	Intervention	Surveyed 2002	2006	2009	2012
Nicaragua							
Dipilto Nuevo – San Augustin	50 households 210 beneficiaries	Peri-urban; existing community	Municipal water system installed (not by ARC) – household taps, gravity fed, spring source Household dry pit latrines ARC Education*	✓	✓	✓	✓
Dipilto Viejo-Solidaridad	90 households 924 beneficiaries	Peri-urban; existing community	Municipal water system installed (not by ARC) – household taps, gravity fed, surface water source Household dry pit latrines ARC Education*	✓	✓	✓	✓
El Rodeo	79 families Population 310	Rural community	Spring, gravity fed, shared household taps Latrines by other NGO, limited ARC latrines, dry pit latrines ARC Education*	No	No	No	✓
Las Manos	99 households 144 beneficiaries	Peri-urban community	One shallow well by ARC with hand pump, gravity fed. Rehabilitating the system to serve 99 more households. 30 households not connected. The community has acquired a new spring to extend the project. 24 latrines installed by ARC ARC Education*	No	No	No	✓
Waspam (Andres /Kum)	199 households in Andres 283 households in Kum	Rural; existing community in flood plain	16 bored wells in Kum and three bored wells in Andres Household ventilated improved pit latrines Education program on hygiene and sanitation in Kum by ARC. No education by ARC*	✓	No	✓	No

Country/study area	Size of community	Type of community	Intervention	Surveyed 2002	2006	2009	2012
El Salvador							
La Ceiba	100-105 households 97 connected (2009) 390 beneficiaries (2011)	Rural; peri-urban resettlement community	Water system-spring source, gravity flow to pumping station, pumped to tank (electric), continuous chlorine tablet treatment, gravity flow to household taps (2002) Household composting latrines ARC Education*	✓	✓	✓	✓
Las Pozas	701 beneficiaries (initial) 1,004 households 696 active accounts (2009) 5000 beneficiaries (2011)	Peri-urban; resettlement community	Water system (CARE)-deep drilled well, water pumped to tank (electric), gravity flow to household taps with water meters, continuous chlorine tablet treatment (2001-2002) Household composting latrines ARC Education *	✓	✓	✓	✓
Mercedes Umana – Berlin	869 households Project serves 8 communities	Peri-urban existing community	Wells, manual pumps, gravity flow to households Water system completed by private contractor. Wells, manual pumps, gravity flow to households Water system completed by private contractor. ARC Education*	No	No	No	✓

Adapted from Evaluation of the sustainability of water and sanitation interventions in Central America after Hurricane Mitch, 2007, 2008 and 2010 reports. Atlanta: U.S. Department of Health and Human Services and CDC: 2012 report-Community descriptions (unpublished document).

**ARC education included: hand washing, water use/storage/treatment (if needed), sanitation and hygiene*

Table 3. Performance indicators reported in the 2002 survey- Final results. *Adapted from Moll et al. 2007*

Performance indicators	USAID Guide/ARC goal	*LL	MC	NS	WP	LP	LC	CQ	HT
Impact Indicators									
Children < 3 years with diarrhea in the past 2 weeks	25% reduction in # cases	19	11	12	36	44	24	22	31
Per capita daily water use (50 lpd)	100% using 50 lpd	25%	71%	13%	0%	29%	21%	12%	88%
Food preparer with appropriate hand washing behavior	50% increase	54%	63%	60%	59%	18%	29%	92%	79%
Child caregiver with appropriate hand washing behavior	50% increase	59%	79%	61%	58%	18%	30%	92%	82%
Population using hygienic sanitation facilities	75% usage	88%	86%	85%	39%	90%	77%	91%	90%
Monitoring Indicators									
Households with year-round access to improved water	100% ARC goal	80%	100%	41%	35%	90%	96%	97%	7%
Households with access to sanitation facility	100% ARC goal	94%	97%	100%	59%	100%	96%	97%	97%

*LL: Las Lomas; MC: Marovia; NS: Nueva Segovia; WP: Waspam; LP: Las Pozas; LC: La Ceiba; CQ:Chiquinula: HT: Huitzitzilt

In addition, education in hand washing and proper use and maintenance of latrines is needed because no improvement in this indicator was observed over time (CDC, 2010). These findings supported the need to understand the reasons underlying the poor sustainability of hygiene behaviors and other issues identified during both assessments such as distrust, discomfort, lack of unity and dissatisfaction with the services received. Consequently, in-depth interviews were conducted in the 2012 assessment with the purpose of extending the results from quantitative surveys and explore individual experiences in relation to the factors affecting WASH sustainability in a 10 year follow-up period.

Table 4. Indicators and factors affecting sustainability. Source: *CDC, 2008 and 2010*

Major indicators	**2006**	**2009**	**Factors affecting sustainability**
Percentage of households with year-round access to improved water source	71%	74%	- Seasonal lack of water - low cost of community water/lack of payment - Distrust of water committees - Intermittent service - Population growth - Severe weather: storms, hurricanes
Percentage of households with access to a sanitation facility	98%	95%	- Runoff and overflowing during the rainy season - Pit latrines reaching their maximum capacity - Septic tanks filling up or leaking into the streets during the rainy season - Lack of funds to acquire construction materials to build new latrines
Appropriate hand washing behavior	44%	51%	- Continued education was not provided by ARC - Community changes (new residents)
Population using hygienic sanitation facilities	77%	77%	- Most hygiene education programs ceased in 2002 - Sanitation facilities reached their maximum capacity

2.3 WASH Sustainability

WASH interventions must be planned and provided in a way that the benefits received by communities would continue over time. For example, sustainable water and sanitation systems

need to meet standard criteria in terms of design and construction; quantity and quality based on local needs and resources; and management of funds and technical support to solve system's breakdowns efficiently (Sijibesma and Postma, 2008). Thought different definitions of sustainability have been provided, I prefer the one presented by Agyeman and Angus, because it includes the concepts of equity and environmental protection, two major components identified in WASH sustainability and environmental health research: "Sustainability is the need to insure a better quality of life for all, now and into the future, in a just and equitable manner, while living within the limits of supporting ecosystems" (Agyeman, 2003).

There is a large body of peer-reviewed literature that focuses in the benefits of WASH interventions provided separately or combined in developing countries. Most of these studies have been conducted in African and Asian countries and in the Central American region to a lesser extent. Furthermore, most of the published literature presents findings from interventions that are followed for relatively short periods of time. Studies on other countries different from those included in this research (Guatemala, Honduras, Nicaragua and El Salvador) have presented sustainability factors based on observations conducted in different follow-up periods. For example, two studies conducted in Bangladesh focusing in the long-term impact of education in sanitation and prevention of intestinal helminthiasis showed a modest effect on knowledge retention after 3.5 (Minamoto et al, 2012) and 5 years follow-up (Hoque et al, 1996). In a study conducted in Pakistan, mothers receiving free soap and education in proper hand washing technique were able to sustain hand washing practices 1.5 years after the intervention although incidence in diarrhea and use of soap did not improved in the subsequent 14 months when provision of soap and hand washing promotion activities were withdrawn (Luby et al., 2001). Other studies have supported the long-term sustainability of educational interventions in hygiene

behavior (Caincross et al, 2005; Eder et al, 2012). In Kerala, Indian women receiving hand washing information during training sessions were practicing proper hand washing after 9 years follow up, indicating that knowledge and behavioral change persisted over time (Caincross et al, 2005). In South America, an assessment of the sustainability of water, sanitation and hygiene interventions after 6 years follow-up showed continuity in the practice of hygienic behaviors and better maintenance of water systems and sanitation infrastructure in communities where the interventions have been provided in comparison to control communities. In addition, the authors of this study suggested that monitoring activities in WASH sustainability may be conducted independently of donor's activities, increasing opportunities for consistent evaluation and local improvement (Eder et al. 2012).

Specifically in the Central American region, the impact of simple, low-cost WASH interventions in diarrheal disease incidence and prevalence has been evaluated in the four countries included in this study (Denslow et al,2010; Fiore et al 2010, Fabiszewski de Aceituno et al, 2012; Corrales, 2006; Luby et al, 2008). However, literature documenting long-term assessments of the interventions provided is limited. A combined intervention including hand washing and household water treatment education in Guatemala showed a substantial reduction in water treatment practices at point-of-use and no significant differences in diarrhea incidence or hand washing behavior after 6 months (Arnold et al, 2009). In Honduras, parasitic loads were used as an indicator of exposure to waterborne pathogens in individuals from communities that had received community-based water treatment systems and flush toilets (Deal et al, 2010). An analysis of stools combined with self-reported data and medical chart abstraction revealed that overall parasitic loads were lower one year after the interventions had been provided.

A great deal of work has been done attempting to measure the impact of WASH interventions in developing countries. However, in an overwhelming majority of the studies available, the scope has been limited to evaluations of the short-term effects (6 months to a few years) on health-related benefits and behavior change. This view is supported by the work of Clasen (2007) who affirms that most water interventions provided in vulnerable populations focus on the provision of hardware without evaluating correct and consistent use over the long term (Clasen,2007). Thus, sustainability assessments are needed to evaluate the factors affecting the longevity of WASH projects. Results from such evaluations will be useful to address community needs and technical difficulties; identify priorities and maximize community investments; and extent benefits on population's health.

2.4 Qualitative research in environmental health and WASH

Qualitative studies are useful to explore perceptions, opinions or local knowledge about events or phenomena (Kangsen, 2010). Among the different sources to obtain qualitative data, face to face interviews are commonly used because they allow gaining an in-depth understanding of individual and community points of view, perceptions and attitudes towards a particular situation or topic of interest (Mack et al. 2005). In the field of environmental health, recent articles have emphasized the applicability of qualitative data in community-based environmental research to explore contextual problems related to health (Kangsen,2010). For example, qualitative studies have been successfully used to identify attitudes, beliefs, activities and behaviors favoring or preventing population's exposure to waterborne pathogens (Halvorson, 2004; Levinson et al, 2011; Banda et al, 2007). In a study conducted in Pakistan, knowledge and behavior related to management of diarrhea, domestic water, and sanitation was explored in low-

income mothers using in-depth interviews, focus groups, and direct observation of participants (Halvorson, 2004). N this study, potential linkages between household practices and disease transmission such as inadequate management of infant excreta and wastewater suggested lack of awareness about activities related to pathways of oral-fecal transmission. A number of studies investigating knowledge, attitude and practices (KAP) have been conducted to explore barriers, facilitators, cultural beliefs and community needs related to water and sanitation (Levinson et al, 2011). In a study conducted in India, open-ended interviews and focus groups discussions were used to identify KAPs related to water handling and usage, and defecation practices. The study revealed that practicing open defecation was preferred over using sanitation facilities and that diarrheal disease was associated to food and other elements different from contaminated water (Banda et al, 2007). Furthermore, in a qualitative study conducted in Kenya, a KAP approach was used to explore communities' perceptions about water-disease links, and barriers impeding access and use of water and sanitation facilities (Levinson et al, 2011). Several community challenges and preference for contaminated sources of water were identified in this study, contradicting the statement that providing knowledge on the causes of disease would result in better adoption of hygiene practices and use of improved water infrastructure.

In addition to KAPs exploration, qualitative studies in water and sanitation research have been useful to assess effectiveness and sustainability factors before, during or after WASH interventions have been put in place (Santos et al, 2011; Phaswana-Mafuya and Shluka, 2005). For example, a qualitative study was conducted in Brazil with the purpose of identifying attitudes and beliefs influencing household's willingness to adopt toilets and sewerage systems (Santos et al, 2011). Researchers utilized semi-structured interviews and anthropological methods to construct a subsequent quantitative survey and evaluate perceptions and current

living conditions of the population before implementing sanitation interventions. In another study performed in South Africa, researchers conducted 15 focus groups with stakeholders and local officials in the Eastern Cape province to gain an insight on the factors influencing people's adoption of hygiene behaviors (Phaswana-Mafuya and Shluka, 2005). Results from the focus groups raised key issues such as improvement of sanitation facilities, and provision of a consistent water supply and health education to consumers. In addition, the role of stakeholders to optimize utilization of resources was emphasized.

Research in ongoing WASH interventions may also benefit from qualitative studies. A three-year ethnographic study performed in four slums in India revealed feelings of frustration, apathy, and distrust to improved sanitation interventions (Joshi et al, 2011). Residents in the slums stated that the sanitation programs offered in the past were inappropriate to their current needs, cultural beliefs, and financial capacity. Findings from this research provided a valuable insight in the factors underlying lack of use and sustainability of sanitation infrastructure and education in hygiene (Joshi et al, 2011). Similar findings were observed in a qualitative study conducted in low-income communities residing in the northern border of Mexico (Cifuentes et al, 2006). Evaluation of a clean water program showed perceptions of inequity, lack of commitment from community members and political corruption. The authors concluded that the interventions provided did not address communities' needs resulting in frustration and lack of participation from their members. A comprehensive assessment of WASH interventions post-disaster was conducted in Uganda in 2010, to inform programming of local and international organizations utilizing a mixed methods approach (Atuyambe, 2011). Qualitative data was used to understand perceptions and beliefs regarding water and sanitation needs of displaced residents living in camps. This assessment indicated that people were reluctant to use sanitation facilities

because of the influence of traditional beliefs such as prohibitions to share latrines among family members and other issues such as fear of sexual violence when using sanitation facilities in the night. In addition, camp residents discussed that they were hesitant to drink the water provided through improved sources because of its bad taste (Atuyambe et al, 2011).

It is evident that conducting analysis of qualitative data has the potential to improve our understanding of complex relationships between participants and the communities in which they live, including the influence of psychosocial and cultural factors that would not be captured using quantitative-only approaches (Kangsen, 2010).

The current literature shows that WASH interventions are governed by a complex interaction among individual behaviors, perceptions of risk, and the influence of social, economic, cultural, and political factors. Therefore, qualitative research may provide critical information to ensure the effective implementation and continuity of these interventions.

To further our current knowledge on the core themes identified by program participants in relation to long-term adoption and sustainability of the interventions provided by ARC in 1998, In- depth interviews collected at a 10 years mark will be analyzed in this research.

CHAPTER III

METHODOLOGY

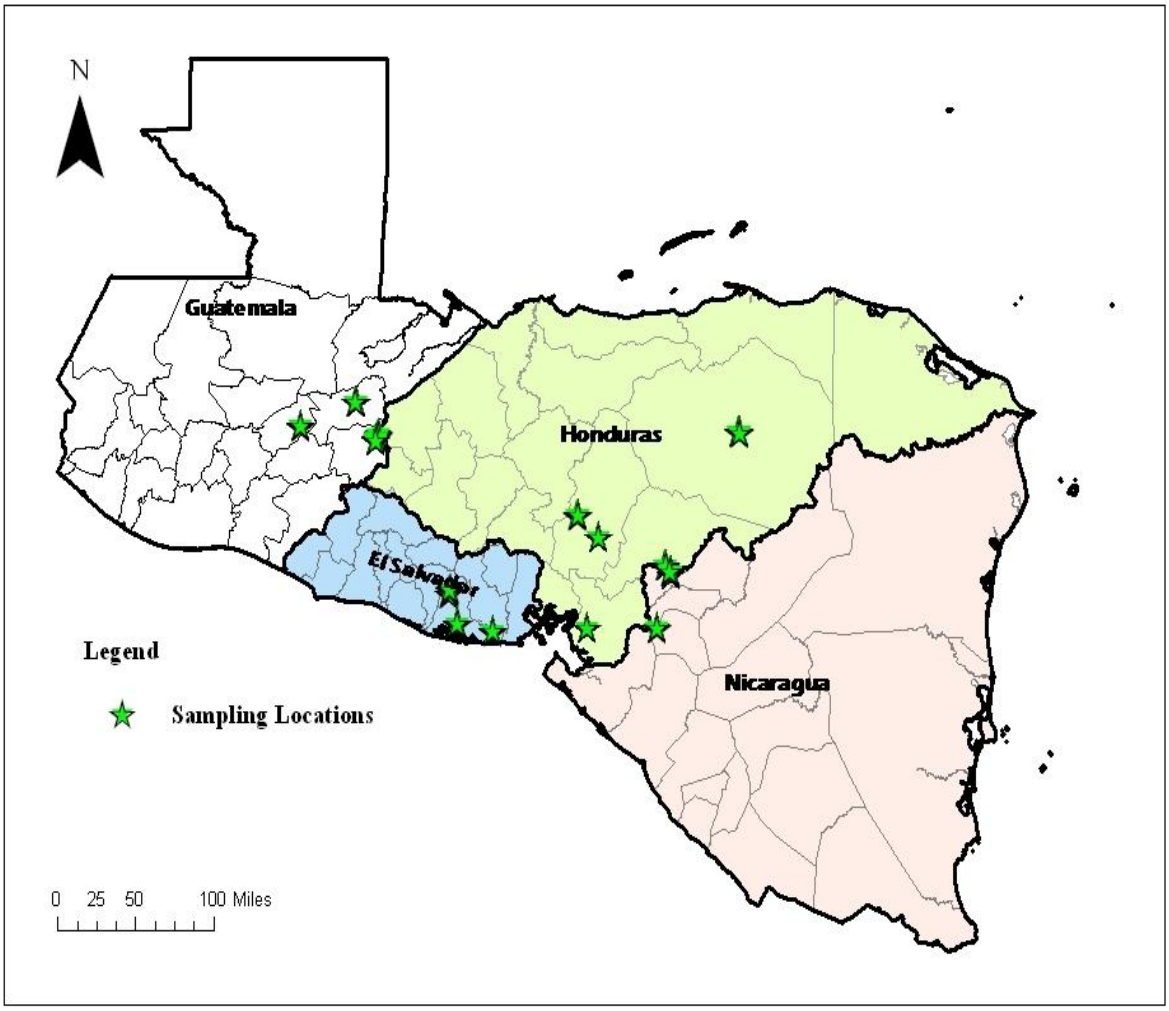
3.1 Study area

After Hurricane Mitch, The American Red Cross provided WASH interventions in more than 100 communities in Guatemala, Honduras, Nicaragua, and El Salvador. A total of fifteen communities were purposively selected in the four countries. Eligible communities had received water; sanitation and education interventions from ARC after Hurricane Mitch, had similar demographics and were located in urban and peri-urban areas. A list of communities and their location is presented in figure 1. Seven communities have been periodically surveyed since 2002 (La Ceiba, Las Pozas, El Guayabo/Filincas, Plan Shalagua, Las Lomas, Marcovia, Dipilto Nuevo-San Agustin and Dipilto Viejo-Solidaridad) and seven additional communities were identified from an existing list of post-Hurricane Mitch communities provided by the local Red Cross societies (Mercedes- Umana Berlin, Colonia Mitch, Santiago Abajo/Manzanotal, Ciudad España, Colonia Cruz Roja, El Rodeo and Las manos).

3.2 Design and data collection methods:

These data were collected as part of a large sustainability study aiming to identify the factors affecting the longevity of water, sanitation and hygiene interventions provided by the American Red Cross in select communities in Central America since 2002. A qualitative approach was used to explore household and individual experiences that will be used to supplement a quantitative dataset (Creswell, 2002).

Figure 1. Study areas selected for in-depth interviews (*Courtesy from CDC-GWASH team*)



Country	Communities
Guatemala	El Guayabo /Filincas, Plan Shalagua, Colonia Mitch, Santiago abajo/Manzanotal
Honduras	Las lomas, Marcovia, Ciudad España, Colonia Cruz Roja
El Salvador	La Ceiba, Las Pozas, Mercedes-Umana Berlin
Nicaragua	Dipilto Nuevo-San Agustin, Dipilto Viejo-solidaridad, El Rodeo, Las manos

Purposive sampling was used to recruit 30 heads of household who were living in the communities when Hurricane Mitch occurred and had household water community water system provided by ARC. The sample size was determined based on Creswell (1998), who recommends that 5 to 25 interviews will be sufficient to explore a single phenomenon. Data were collected through semi-structured interviews between February 16th and March 3rd of 2012. A semi-structured interview guide was used to encourage heads of household to discuss their perceptions in relation to three major themes: 1) Water- use, availability, access, safe handling and/storage; 2) Sanitation-use and availability; and 3) Hygiene education- proper hand washing technique and hygienic latrine maintenance and use (see appendix B).

Interviews were conducted by CDC personnel from the Global Water Sanitation and Hygiene (GWASH) team in Spanish. Interviewers were experienced in field data collection, knowledgeable in water, sanitation and hygiene education programming, and fluent in English and Spanish. Prior to data collection, team members pre-tested semi-structured surveys with bilingual persons not familiar with the survey.

Participant's verbal consent was requested by the researchers before initiating the interviews (see appendix A). A script indicating the purpose of the study was read out loud to each potential respondent. Participants were informed that their participation was voluntary and they were free to refrain from responding to any questions in the survey at any time. They also were informed that no information about their identity would be disclosed and their responses would not be used to exclude them from any community services.

All interviewees participated voluntarily in this study, no financial compensation was provided. The 30 interviews took place in interviewees' homes and were approximately 35-45 minutes in length.

3.2 Data management and analysis

Semi-structured interviews were tape-recorded and transcribed verbatim upon return to Atlanta by native-Spanish speakers. Although transcripts were translated into English, a decision to perform the coding and analysis processes in the original language was made to ensure cultural accuracy and prevent unintentional changes in meaning. Alteration in the meaning of what has been expressed may occur because not all words and expressions can be transferrable between languages (Larkin et al. 2007).

Transcripts were coded with a respondent number, name of the country and name of the community. Subsequently, they were entered as rich text format (RTF) files into the qualitative data management software MAXQDA 10© (Berlin, Germany) to facilitate data coding, text retrieval and further analysis.

One third of randomly selected transcripts were read several times to identify codes. Codes were developed deductively and inductively (Hennick, 2011). Deductive codes were elicited from a literature review on WASH interventions in developing countries, results from the previous quantitative assessments conducted by CDC in 2006 and 2009, and the guide questions included in the open-ended questionnaire. Inductive codes were elicited from issues, emotions or topics highlighted by study participants. Codes identifying metaphors or expressions unique to respondent's culture were also captured (Hennick, 2011). For example, the word "Tamarindo" (tamarind in English) was used by interviewees to identify members of their water committees that were not managing community resources appropriately. Codes were organized in a codebook including their respective definitions, inclusion/exclusion criteria, and examples from the data. Intracoder and intercoder reliability was conducted to test the validity of the codebook

as well as the overall quality of the coding process. A more detailed description is provided below in numeral 3.4. Once the codebook was validated, all the 30 transcripts were coded. Coded data was systematically examined for emerging themes. Themes that emerged from the open coding and direct quotes discussed by participants were categorized in matrices (Ulin, 2004 and Hennick, 2011) (see example in appendix C). Then, axial coding was used to compare, analyze and identify relationships across and between the narratives (Strauss and Corbin,1998). Variation of each theme was thoroughly evaluated considering different aspects such as depth of the information, context and variation among different respondents or households, and evidence supporting specific issues across the data. Any ideas, hypotheses, gaps, questions, uncertainties or preliminary conclusions generated during this step were documented in memos that were included within each transcript or interview. In addition, interpretations of retrieved text segments and descriptions provided by study participants were discussed with the main interviewer. Different themes arose regarding hardware and behavioral interventions. Some themes were specifically related to one type of intervention (water or sanitation or hygiene education) such as participant's perceptions of "too much chlorine" in their drinking water. Other themes were common across the three WASH interventions. For example, perceptions of inequality, self-financing, household priorities, population changes and vulnerability to environmental events were frequently expressed by heads of household.

The overall process was often iterative, with a series of re-visits to the raw data or previous steps to validate connections, ideas and conclusions regarding core concepts (Hruschka et al, 2004) An audit trail was created to record, update and track raw data, analysis products, reports, notes or memos, and protocols (Ulin, 2004).

3.3 Quality control measures

3.3.1 Assessment of reliability

Intracoder reliability was used to evaluate internal consistency in a subset of 15 (50%) of the interviews. In addition, intercoder reliability was assessed as a measure to reduce bias and random error when evaluating the content of the interviews (Hruschka et al, 2004). Once the initial codebook was developed by a lead coder, a random sample of 25% of the transcripts including interviews from the four countries was selected. Then, the second coder coded the transcripts independently. The coefficient of agreement between both coders was calculated by using the qualitative data management software MAXQDA10© (Berlin, Germany) and Cohen's kappa values were calculated using the quantitative analysis software SPSS to correct for chance agreement. The kappa value identified to evaluate agreement in this study, was the one proposed by Cicchetti (1994). Ranges of agreement established in Cicchetti's paper are: 0.75-1.00 excellent, 0.64-0.74 good, 0.40-0.59 fair and less than 0.40 poor. Based on this values, we required that at least 80% of codes had a Kappa value greater than 0.63. Sufficient intracoder and intercoder reliability was achieved after the first round of coding, with kappa values of 0.72 and 0.89 respectively.

3.3.2 Triangulation

Due to time and budget constraints it was not possible to evaluate if the themes and codes defined during this research would have been recognized by members of the study population. However, triangulation was undertaken by using different data sources (Creswell, 2002). Findings were validated by comparing data from the semi-structured interviews with raw data from a quantitative community assessment and an infrastructure survey provided by CDC's researchers, photographs, existing literature and discussions with the lead interviewer. For

example, official reports from the Pan American Health organization (PAHO), research studies regarding causes of chronic kidney disease and occupational exposure to chemical contaminants in central America, and data from the community survey regarding procedures to disinfect the water used by water committees were used to gain an insight into the perceptions of fear to drink treated water expressed by participants from the three communities in El Salvador.

3.4 Ethical considerations

3.4.1 Privacy

No personal identifiable data was collected. Names of heads of household were not recorded. Recorded information (audiotapes) and digital transcripts were secured in a locked file cabinet and were accessible only to the principal investigator and project staff members. Audio recordings will be destroyed five years after the end of the data collection, February 2017.

3.4.2 IRB Approval

The research protocol was submitted to a CDC's institutional review board (IRB) to determine if it was human subjects' research requiring approval. A CDC official determined that the primary intent of this work was related to public health program activities so that results could be used for further community improvement. The "Determination of Applicability of Human subject regulations" form was completed and signed on February 2, 2011. A copy of this document is available upon request to the CDC- GWASH team.

Chapter IV

RESULTS

4.1 Individual experiences and challenges related to WASH programs provided by ARC

4.1.1 Access to water infrastructure

Access to water infrastructure has been defined as having year-round access to an improved water source such as a direct connection to the home or having access to a public facility located no more than 200 meters from the household (Billing et al, 1999). Results from the 2009 survey conducted by CDC, showed that 87% of all households had access to an improved source of water such as a community water system, and private or shared taps or wells (CDC, 2010). In the 2012 qualitative assessment, participants were asked about their major source of water and the factors driving or impeding access to these sources.

Almost all the participants reported that they have household connection to community water systems and use tap water as their primary source for drinking and cooking. Only the two heads of household from Plan Shalagua, Guatemala expressed that they no longer had access to tap water at home due to a major damage in the water system that has not been repaired since 2011 and were collecting water form unimproved sources such as a stream and an unprotected well.

(I: Interviewer)

(R: respondent)

R2-Guatemala/Plan Shalagua:

I: Where do you get your water from?
R: From a well. There is a little well over there… we all get water from that well
I: What do you think about the water from the well? Is it clean?
R: Probably not. But we need the water and there is nowhere else to go

Interviewees from households with access to water connection participated actively during the initiation of the project, assuming different roles in construction, logistics, and administrative tasks or preparing food for workers. Overall, interviewees reported that the desire to reduce the physical effort and time spent collecting water, convenience, and the feasibility of paying for water services were the major reasons for wanting to bring water to their house.

> **R1-El Salvador/La Ceiba**: *Yes, having a water system is very good. Although sometimes is difficult for poor people like us to pay. However, if we think about the amount of time spent collecting water from the river in the past, then we realized that the cost of the water was actually higher.*
>
> *I: ¿do you mean, the cost of spending your time collecting water?*
>
> *R: Yes, yes…because there were occasions when we were still collecting water at this late hour… now we only need to be concerned about making enough money to pay monthly fees, but that is a smaller sacrifice…*

> **R2-El Salvador/Las pozas**: *I like to have water at home because I do not have to bathe in the river anymore, I feel really happy.*
> *I: ¿Is there enough water for all your needs?*
> *R: Yes, yes…24 hours a day…*

Financial capacity was both, a promoter and a barrier to individual's participation in water projects. Individuals with lower financial resources were not able to pay high connection costs and made arrangements to either obtain water from their neighbors or from illegal taps. Other limitations identified for study participants were distrust in the water project and lack of time to help in the construction of the community system due to economic activities and other priorities. Individuals who moved to the communities after ARC's projects have been completed built new homes, but water connections were no longer being offered.

R2-Guatemala/Manzanotal-Santiago abajo

I: Did you help in building the water system?
R: Yes
I: How did you help? Did you work in the construction?
R: My husband paid somebody to work in the construction, he did not have time to go there, but he paid somedody.

4.1.2 Water sufficiency and continuity

Water was provided at different time intervals across the different communities. Almost half of the interviewees said that they had water 24 hours seven days a week while the remaining half reported times as short as 2-3 hours one day per week. Interestingly, all people interviewed mentioned satisfaction with the service and amount of water received for daily use independently of amount and frequency of available water. In communities where water service was intermittent individuals had no other choice than to use unimproved sources of water. In households where piped water was available it was always reserved for cooking and drinking and for the children, while water from unimproved sources was used for bathing, washing, household cleaning or irrigation of agricultural crops.

(**R2-Nicaragua/Las Manos**): *We use two sources of water. One is for drinking, and the other one is for washing. The water from the tap is only for drinking.*

I: ¿where the other water comes from?

R: It comes from a hill, from a private property. At least is useful for washing… we used to drink that water before but, now that we have this project (ARC water system) we do not drink the other water, because the water from the project is treated.

A major issue brought up for study participants in relation to water sufficiency was equity. In households where water meters have been placed, participants did not have any

complaints about the amount of water spent by large families because they paid accordingly to the amount of water used. In addition, members from these households were more likely to ration the water and not to spend it in excess.

> **R2-El Salvador/La Ceiba** *: When I have to wash hammocks or bedding, I go to the river*
> *I: To the river?*
> *R: Yes, if I use more water, then the bill is more expensive. We prefer to go to the river for washing or bathing because the water fee is already high.*

In contrast, in households where the cost of water is fixed regardless of the amount of water used, participants perceived inequalities in the amount of water used for larger families. Moreover, interviewees mentioned that not all households in their communities paid their water fees on time, resulting in insufficient funds to make repairs and water cuts.

> **R2-Guatemala/Colonia Mitch**: *We all agree that paying the water fee consistently and timely is necessary. We always pay on time, but there are people in the community who have not paid during two or three months. Because of those who do not pay, the water is cut in the whole community. Sometimes we do not have water for 7 or 8 days because other people are not responsible.*

Almost half of participants said that they will be willing to pay for the water services they expect. These heads of household expressed that they understand the need for technical assistance and spare parts to keep the systems working. One participant said that he would be willing to pay a larger fee if the water committee is honest, and almost one quarter of participants expressed that they are already struggling to pay current water fees due to the difficult financial situation in their communities.

R-1Honduras/Las Lomas*: So far, we are doing ok. But if they increase the water fee…I do not know what would I do…sometimes money is scarce…and we are eight people in this household*

4.1.3 Water treatment and storage

Half of the respondents agreed that the water received through the community system was of better quality compared to surface water or unprotected wells. Reasons to consider the water as of good quality were: the water system is well maintained and water is disinfected, children and/or adults have not gotten sick anymore, and water looks clean or has no bad taste.

R-2 Nicaragua/Las Manos *I think that the water is good because the system is well maintained. We do not drink other water anymore…*

In contrast, poor organoleptic characteristics were frequently mentioned as reasons to consider the water as being unsafe or of bad quality. For example, some participants said that sometimes tap water was "dirty". Dirtiness was related to presence of visual cues such as mud or a "brownish" or "yellowish color". Moreover, some of them stated that they did not prefer tap water because it had "bad taste" or was "not safe". Both, bad taste and unsafe were usually associated to the presence of "too much chlorine" in the water. Perceptuions of "too much chlorine" resulted in reluctance from family members to drink chlorinated water, fear of becoming ill and lack of motivation to practice point-of-use water treatment. Conversely, some participants discussed that drinking chlorinated water was not an issue because they became "used to" the taste after certain time.

R2-Guatemala/Colonia Mitch

I: So, what do you think about the water? Do you like the taste? Do you think that it is clean?

R: Well, we do not think that the water has a bad taste because we have been drinking the same water for almost 13 years. We do not feel a salty taste or anything else. There is nothing different in the water.

Another factor limiting point-of-use water treatment was reliance on community water treatment. Given that almost ¾ of heads of household mentioned that they store water due to frequent water shortages, point-of-use treatment seems to be a critical factor to prevent water contamination with hands and containers.

R2-Guatemala/El Guayabo-Filncas

I: Did you say that you prefer chlorinated water?

R: Yes. Ii is better when the water has chlorine because is disinfected. Then, if it has already been disinfected, why we would have to disinfect the water again?

Most families said that they store their water in a variety of containers such as "cántaros", "baldes" or "pilas". The "pilas" are large containers made of concrete usually located outside the household. To cope with unsafe water, some participants purchase bottled water or water in barrels which sometimes is even more expensive than the local water fees

R2-Guatemala/Colonia Mitch: *Everything is becoming more expensive. Electricity is costly and the water pump demands large amounts of energy. Therefore, we have to pay the water fees, no matter what. We are nothing without water. If we can buy a barrel of water it is not the same.*

4.1.4 Access to sanitation infrastructure

Most of the participants reported having access to improved sanitation facilities such as toilets or different kinds of latrines. Those with current access participated in the initial project lead by ARC and most of them have been able to maintain their latrines in fairly adequate condition. Other interviewees said that they built their own latrines or received help from other local or international organizations.

R-2 El Salvador/ Mercedes Humana Berlín

I: So, did the American Red Cross give you a latrine …?
R: No, we did not get a latrine. They (referring to family members) dug a hole and bought the materials…
E: Are you still using it?
R: Yes, it still works.

R-1 Nicaragua/El Rodeo

I: Did you have any problems with the latrines, here in your community?
R: Yes… at the beginning, there was not a project. Then, The Red Cross came here to offer us latrines…after they leave other projects (organizations) have come to support us…

Lack of motivation, time or funds resulted in families with no sanitation. New houses were constructed without latrines once ARC's project finished. Interviewers were told by a few heads of household that some of their neighbors did not see the need for acquiring a latrine or that they would be willing to build a latrine if new projects are proposed in the community. Families who did not have sanitation reported that they practiced open defecation, built dry pit latrines of poor quality by themselves or shared latrines with their neighbors.

R-2 Guatemala/El Guayabo-Filincas

I: So, the majority of the households here have a latrine that was donated by the American Red Cross
R: Yes, the majority have latrines. Only those who did not want a latrine do not have one.
I: Why they did not want a latrine?
R: They were saying that a latrine was not necessary because there was plenty of grass around. Now they are asking for a latrine.

Though access to basic sanitation is improved, participants reported inadequacy of the latrines provided by ARC and lack of financial means to maintain them or make improvements as the limiting factors for their inability to sustain household sanitation facilities.

R-2 Honduras/ Colonia La Cruz Roja: *The problem that we are having in this community right now, is that they built the houses (ARC) with pour flush latrines, but they did not anticipate that water was going to be insufficient*

R-1 El Salvador/ Las Pozas

I: Could you please explain to me what was the problem with your composting latrine?
R: The problem is that we were not able to maintain it. Most of the people in this community decided not to use them anymore because we realized that we could not take care of them.
I: Do you mean that you cannot afford ash or lime to put into your latrine?
R: The problem is that we do not have money to buy those things sometimes… poverty here is outrageous…

In addition, other barriers such as poor soil characteristics, overflow during the rainy season and increased family size, hinder installation and usage.

(-1 Guatemala/Plan Shalagua*The issue here is that the soil is rocky. Others have tried to build latrines but they have been unsuccessful because here the soil is pure rock/slope.*

R-2 El Salvador/ Las Pozas: *Here the quality of the soil is really bad. Therefore, during the rainy season latrines collapse. It is dangerous because they collapse.*

4.1.5 Hygiene education and hand washing

Almost ¾ of the heads of household interviewed recalled having received training on proper hand washing and/or hygiene practices and maintenance of latrines at some point during the past 10 years. Providers of training sessions were either members from international organizations such as ARC and NGOs, or people from local institutions such as promotoras (community workers) or nursing students. In most communities, ARC stopped providing education programs after 2002. Despite the lack of consistent training and reinforcement of health messages, a few interviewees perceived community improvements in the incidence of waterborne diseases, particularly in children's health.

> **R-1 Guatemala/ Flincas:** *Since they came to training us, it seems that children are not getting sick anymore. Children got sick very frequently in the past, before they came to teaching us.*

> **R-2 El Salvador/ la Ceiba**
>
> *I: Do you think that the health education sessions were useful?; do you practice the lessons learned?*
> *R: Yes, of course…because I wash my little daughter's hands before feeding her… always.*
> *I: So, Your children have not gotten sick anymore . ¿Has it been useful for them?*
> *R: Yes, it has been useful.*

Overall, training sessions were perceived as "necessary", "good" and "useful". Almost all participants reported that they remembered and practiced the lessons learned and a few of them expressed that they were not consistent applying the knowledge acquired. Hand washing with soap was the lesson recalled and used most frequently by almost ¾ of heads of household.

> **R-1 Nicaragua/ San Agustín**: *Yes, I apply what I learned. Because when I am going to cook I wash my hands. For example, I have children and I always wash my hands after changing diapers…because it is hygienic…because children do not get sick…neither do we…*

R-1 Honduras/Colonia La Cruz Roja: *To me, the trainings are very useful… the issue is that we are just human beings and sometimes we forget the things that we have learned…we just forget…*

4.2 Key themes raised by study participants in relation to the sustainability of WASH interventions

Challenges to sustain WASH interventions were described under seven categories. A description of these categories is provided in table 5. The major issues identified by program participants regarding each category are discussed below.

4.2.1 Unequal distribution of resources

Perceived inequality was frequently brought up during interviews. Heads of household reported that the amount and quality of water and infrastructure received as well as education opportunities and invitations to participate in community meetings were unequal within different sectors in the same communities. Participants frequently compared to their neighbors and mentioned having either "better" or "worse" services.

R-1 Honduras/Ciudad España: *Trainings are being provided by promotores de salud (community health workers) and sometimes they conduct the trainings but we do not even know when or where… ¿do you understand?. Then, it is a lack of communication because people in the border can go to the trainings and we cannot.*

R-2 Nicaragua/San Agustín: *Here we have to work hard to sustain our community, dig ditches, maintain everything…because we do not have any support from the authorities…like if we were not humans… meanwhile, other communities around receive support, but there is nothing for us.*

Table 5. Themes elicited by study participants in relation to the sustainability of WASH interventions

Themes	Concerns expressed by program participants
Unequal distribution of resources	*Differences in the amount or quality of water and services received across and between communities *Community meetings and trainings are not announced in all the neighborhoods *Only some communities receive help from the government. Political affiliation is important. *Water fees are not proportional to family size
Lack of responsibility	*Neighbors are carelessness or did not receive education *People do not pay water fees on time *Intentional deforestation *Contamination of water with pesticides or agrochemical waste *Lack of hygiene: inadequate waste disposal / discharge of wastewater into the streets
Insufficient funds	*Dated and damaged pipelines cannot be repaired *Lack of financial support: internal/external *Low water fees/community capacity and willingness to pay higher fees
Vulnerability to natural events	*Frequent storms: falling trees and floods damage water and sanitation systems *Dry season: aquifers run low and water is rationed Pit latrines filling with runoff and overflowing during the rainy season. Tanks collapsing *Soil composition is not suitable for construction/Not enough land to dig latrines

Themes	Concerns expressed by program participants
Absence of leadership (water committee)	*Lack of representation when problems occur *Insufficient training *Inefficiency: reparations are not make on time *Dishonesty: poor management of financial resources *Lack of communication between committee and community members
Lack of ownership	*Individual: shortage of assets, insufficient time living in the community *Need of community approaches for empowerment of community members
Population changes	*Transient population, new families move into the community and build homes, newborns, increase family size (children become adults) *Water systems cannot supply sufficient water to a larger population *Latrines reaching out their capacity more quickly

4.2.2 Lack of responsibility

Participants reported that neighbors throwing trash and wastewater into the streets or breeding domestic animals in unsanitary conditions; careless smokers initiating forest fires; and people who do not pay their water fees on time which affects the ability of the water committees to make improvements or repairs in the community water system were threats to sustainable water and sanitation.

> **R-2 El Salvador/ Mercedes Umana Berlín**: *I told to a neighbor that she should burn that mound of garbage in front of her house…I know it is not my business, but it is a duty.*

She replied to me that burning the trash was not her responsibility that somebody else had to do it. Then I replied: what if nobody come to clean the trash?...It is up to you..

The lack of knowledge and education was discussed as a major barrier to responsible hygiene behaviors in the communities. Usually, new community residents had not received previous information in sanitation and maintenance of latrines resulting in actions that cause discomfort among other community members. Older participants interviewed in the communities said that they would like more educational opportunities for new community members and for their older children who 12 years after the hurricane have moved and become heads of households.

R-1Guatemala/Filincas: *We want more training. Because trainings are important. For example, I have a latrine for my family. But as my wife already told you some people do not like to use a latrine and they are contaminating the natural sources of water. That is why we need more training. For those who do not use a latrine.*

4.2.3 Insufficient funds

Lack of resources and support from local or foreign organizations was described by heads of household as a barrier to achieve consistency in the water service and improve water and sanitation infrastructure. Although fees for water services have been established in most communities, they have not been sufficient to acquire supplies and cover the expenses of water system repair. When participants were asked about their willingness and capacity to pay higher fees, opinions were divided as to whether or not they would be able to support larger payments according to the level of service expected.

R-2 Honduras/Ciudad España: *I suspect that they are stealing money (water committee members)…I do not know what they do with all the money. Sometimes they get up to $150,000, but where is that money going to? I will be willing to pay only if there is an efficient and transparent management of funds*

4.2.4 Vulnerability to natural events

Numerous adverse weather events have occurred since the interventions were put in place by ARC. Participants said that overflow of household latrines and septic tanks during the rainy season have resulted in fear of getting sick, or building latrines.

> **R-2 El Salvador/Las Pozas**
>
> *I: Here, the soil is very bad….*
> *E:¿During the winter, when it rains?*
> *R: Yes, the latrines collapse…It is dangerous because they can be carried away*

Seasonal variation changes the amount and quality of water received through household taps. During the dry season, water is insufficient and frequently rationed to ensure supply to all community members. In contrast, water is abundant during the rainy season, but changes in the quality of the water are observed because of contamination of drinking water sources with storm water runoff pollution.

> **R-1 Nicaragua/San Agustín**: *Sometimes, during the dry season water pipes get broken and we have no water at home, the stream gets dry and there is not sufficient water, we live for about 2 to 3 days without any water. To cope with that we collect and store water in buckets. During the winter though, it is different, but we always have problems during the summer.*
>
> **(R-1 Honduras/Ciudad españa)**: *Our water comes from a spring, it is not ground water. Therefore, when it rains the water carries on mud and the stuff…but we only see that during the winter…*

4.2.5 Leadership (water committee)

"Water committees are defined as groups of local citizen representatives who are responsible to administrate, operate and maintain the water system in a given community" (Moll et al. 2007). Respondents showed different perceptions and attitudes towards their current

committees. Both, positive and negative opinions focused on three aspects: management of funds, protection of systems infrastructure, and communication. Generally speaking, people recognized that the role of water committees is important and leadership is needed to effectively address deficiencies in the water service. However, complaints related to inappropriate management of funds, corruption, lack of technical capacity, inefficiency to repair, clean and maintain the system, and communication gaps were brought about consistently. In communities were the committees have been stable, users satisfaction seems to be higher and system improvements seem to be done in a timely basis. Disapproval of committees is sometimes associated with increases in water fees.

> **R-1 Honduras/Colonia La Cruz Roja**:*The new committee is doing a great job. At least for me, but I do not know about other people…people got angry because the water fees were increased. I think that paying a little bit more is fair because the cost of energy is higher too. If I have to pay up to $500 in utilities, I cannot imagine how much money the committee would have to pay, considering that the water pumps work day and night.*

4.2.6 Ownership and time lived in the community

After Hurricane Mitch, new houses were constructed and donated to displaced and affected families. Beneficiaries of these homes who had been living for more than 5 years in the same area showed positive attitudes towards the activities and current situation of their communities such as commitment and participation.

> **R-2 Nicaragua/San Agustín** *At the beginning, we had water all the time. Almost 6 years later water amount begun to decrease because frequent wildfires were damaging our water supplies. Then we began to reforest…we have been maintaining the forest and now there are less fires because people are more careful…*

In addition, community ownership of assets resulted in empowerment of members to sustain and oversee their water system in one of the communities surveyed. There, the water system was built with support of ARC and an international NGO.

> **R-2 El Salvador Las Pozas**: *The water system belongs to the community. We received a deed in which it was established that the water system belongs to us. It is not owned by a person or the local municipality. It is our system. CARE from El Salvador gave the system to us, to the community of "Las pozas".*

4.2.7. Population changes

Unexpected growth of communities due to either migration or increase in family size has resulted in limited access to water and hygiene problems such as incorrect disposal of solid waste and wastewater, lack of hygiene education and limited access to basic sanitation. Less commonly mentioned was migration of families to other communities due to scarcity of jobs and opportunities for development.

> **R1-Honduras/Colonia La Cruz Roja**: *I am not satisfied with the water service because the water supply is not enough for all the people. Now the population is larger and the water tank does not have the capacity to supply water for all. This change was not predicted at the beginning of the project. Things change over time, water becomes scarce, energy gets more expensive and people also change. Here, we have a totally new generation of people and many children have been born. Unfortunately, people do not understand that.*

> **R-2 El Salvador/Las Pozas**
>
> *I: Why are people moving out of this community?*
> *R:Well, almost 70 percent of sector 3 is empty because people have moved away. They were relocated here after Mitch, but they had better assets where they were living before the hurricane. Once everything got back to normal, they could not find jobs so they decided to find another place to live.*

Chapter V

DISCUSSION AND CONCLUSIONS

5.1 Discussion

This exploratory study was conducted to look into individual perceptions and household challenges experienced by people who received WASH interventions from ARC post-hurricane Mitch after a 12-year follow-up. The results of this inquiry were used to identify themes arising around sustainability issues that may be used for further studies aiming to developing better WASH interventions in the Central American region.

Results from this inquiry showed that not all communities were able to maintain water systems with their own funds after financial support from ARC ended. The majority of participants receiving ARC interventions did not revert to using unimproved sources of water or defecating in the open. However, in communities where lack of funds was a major barrier, water systems were no longer working as in the case of Plan Shalagua in Guatemala, or were not working to their maximum capacity, leaving community residents with no other choice than collecting water from unimproved sources and going to rivers and streams for washing and bathing. In addition, poverty and lack of jobs lead to decreased capacity to pay for water fees and acquire water connections or update sanitation infrastructure.

In the population studied, having latrines was associated to hygiene and desire to live in a clean environment and was considered a basic need. No stigma or cultural prohibitions to the use of latrines or the practice of open defecation were mentioned by the heads of household interviewed. Other studies conducted in different populations and regions have described additional drivers to latrine's ownership such as prestige or social status (Hoque, 1996; Cotton et

al, 1995). It may be hypothesized that this was not the case in the communities studied, because ARC's interventions were provided after a natural disaster. Loss of material possessions, displacement and time spent in camps may have resulted in prioritization of basic needs as a mean to recover from a difficult experience. Therefore, this topic may be worthy of further exploration in a larger and more diverse sample.

The perceived benefits of the interventions on population's health and well-being strengthen the continued use. At the individual level people showed preference for improved sources of water and latrines. Having water at home was considered "a blessing" and outweighed budgetary constraints or time spend performing economic activities when the systems were constructed. For those without access to sanitation and water services, lack of knowledge about disease pathways, lack of funds, and prioritization of other activities were major limiting factors. Further research will be needed to elucidate the reasons of these attitudes towards WASH interventions in Central America. No additional information can be provided in this research because we only targeted participants who had received ARC's interventions.

Concern about children's health and knowledge about disease pathways seems to be a critical factor for adopting and sustaining preventive behaviors (Haroun et al, 2010; Mwambete and Joseph,2010;Osumanu, 2008). This highlights the importance of providing continuous education to women and caregivers in the microbiological and chemical causes of disease to ensure prolonged use of improved water and sanitation (Kauchali etal, 2004, Levinson et al, 2011). Time spent in water treatment also reflects concern about water safety and acquisition of illness. Though heads of household may be discouraged from practicing point-of-source chlorination due to perceptions of bad taste or danger, education in household water treatment must be reinforced by either emphasizing the use of different techniques such as filtration or

solar disinfection or elucidating the benefits of chlorination previous consideration of financial feasibility (Rufener et al, 2010; Mintz et al, 1995, Stauber, 2006).

From interviews and triangulation with quantitative data and observations (unpublished information), a hypothesis can be suggested that in communities where water chlorination at the community level is consistent, people become used to the different taste produced by chlorine over time. In contrast, residents in areas where community chlorination is not consistent will be more likely to notice taste differences and look for alternative water sources. Other research has shown similar findings in relation to disapproval or dislike of chlorine in drinking water in the Latin American region (Arnold et al, 2009). A broader exploration on the contextual and individual factors leading to these perceptions will be needed.

Many participants aligned with feelings of fear and vulnerability due to the lack of institutional support and frequent occurrence of natural events. These factors demotivated people to build latrines or use water from the community system. Distrust of water committees lead to reluctance to pay water fees. In the absence of leadership and local support, community systems were abandoned or operate erratically. Perceptions about performance of water committees were divided because two interviewees in the same community may have positive, negative or in between perceptions based on their own experiences and unique committee roles such as collecting water fees. For example, increases of water fees resulted in negative opinions.

Results indicated that social capital is important in all the communities studied. Though financial capacity seems to be highly important for sustainability, the lack of unity is a potential barrier to sustain WASH projects. Establishment of community-based approaches and elimination of political disparities may enhance unity by allowing community participation and empowerment (Cifuentes et al, 2005; Da Costa Silva, 2011). Lastly, consistent community

education was perceived by project participants as critical to create positive change in their community.

Comparisons between communities were frequently observed in participant interviews. Research has shown that user's perception of satisfaction is higher when they think that in comparison their peers; they have better services (Tversky and Kaheneman 1991 and Vasquez et al, 2012). To express satisfaction or dissatisfaction with the interventions received, interviewees tended to compare their communities to others. As a result, perceptions of inequality were brought up in relation to quality of the services and infrastructure received, and opportunities for support and participation. These results highlight the importance of getting an insight on the factors facilitating similar levels of participation and provision of WASH infrastructure within and across neighboring communities to improve perceptions of equity, particularly during post-disaster events.

5.2 Study Limitations

There are limitations to this study. Hypotheses were drawn from in-depth open-ended interviews and biases in the answers may have occurred due to several reasons: 1) Since this study is an exploration of opinions and perceptions about interventions provided by a well-known international organization, interviewees may have chosen to provide favorable opinions, as a strategy to maintain good relationships for further support; 2) Recall bias may have occurred because this inquiry was conducted 10 years after the interventions have been provided. Some participants communicated that they were not able to recall who provided latrines or training sessions in their communities. In addition, more than eight different organizations, local and foreign were mentioned during the interviews as providers of sanitation education, water or latrines. However this was not likely to hide the role of ARC as participants frequently referred

to ARC as they major source of support; 3) Gender and population differences cannot be addressed because respondents were predominantly female and no members from Indigenous populations or other cultural groups were interviewed; 4) Interviews were not conducted by the researcher. However, to minimize this bias, information provided by study participants was triangulated with information from a quantitative data set, photographs, and multiple discussions with the original interviewer.

5.3 Conclusions and recommendations

The purpose of this study was to explore individual experiences and themes brought by heads of households in relation to the sustainability of WASH interventions in fifteen communities in Central America. The major themes identified by project participants at the individual and household level have been presented and discussed in this paper and will be summarized below along with recommendations from future research.

Trust and Unity: Building trust within community members and providing interventions that are consistent with local resources and the financial capacity of intervention users will support locally driven collaborative projects (Flores et al, 2009; Da Costa Silva, 2011). Communities receiving WASH interventions should be encouraged to participate in activities of design, construction and maintenance under continuous guidance and support. From participants' interviews it can be inferred that most communities possess members with communication and construction skills. These individuals may be good candidates to support latrine building and updating as well as to deliver health education messages. An exploration of community based participatory approaches to sustain WASH interventions may be recommended for future research, programs or investments.

Financial support: Establishing effective inter-agency relationships with local organizations to provide a consistent supply of funds for reparations and technical support will improve committee's ability to 1) Perform routine maintenance of water and sanitation systems; 2) Partner with local providers to ensure availability of materials for construction and disinfection products for water treatment; and 3) Provide a timely and efficient response to infrastructure damage following weather events (Jalba et al, 2010). Further research on barriers and strategies to improve participation of local government institutions is recommended.

Equity: Participants indicated that unequal distribution of resources and access to educational opportunities resulted in feelings of vulnerability, discomfort, lack of awareness and irresponsible actions. An in-depth understanding of the reasons underlying these inequalities will be needed and should include different groups participating in water, sanitation and health education such as local governments, stakeholders, bilateral and multilateral organizations, water committees, local associations, NGOs, etc.

Leadership: Careful selection and training of committee members would be critical to increase communities' acceptance of increments in water fees and create a sense of support and local representation. Water fees adjusted to community expenses and individual circumstances will allow sustaining savings accounts for emergencies and timely repairs, improving users' satisfaction. More research must be done to elucidate the best strategies to choose, train and sustain reliable water committees.

Adequacy: Participants shared that some ARC-supported latrines were not adequate to current community needs for different reasons: 1) The quality of construction was weak; 2) Increase in family size was not predicted; 3) Composting latrines were too cumbersome to maintain and compost was not always needed; 4) Poor flush latrines cannot be cleaned or

maintained when water is not available in a regular basis. Assessment tools comprising socio-cultural, technical, health, environmental, institutional, and financial factors are available in the peer-reviewed literature (Henriques and Garrick, 2011; Katukiza et al, 2010). Further assessments of viability for selecting sustainable sanitation technologies and drinking water supplies may be useful to effectively address community needs.

Note: the content of this paper is solely the responsibility of the author and does not represent the views of CDC.

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APPENDIX A

Verbal Consent Script-Key Informant Interview

English and Spanish

Central America Water and Sanitation Program Sustainability Evaluation:

KEY INFORMANT INTERVIEW – English verbal consent script (Feb 2012)

Central America – El Salvador, Guatemala, Honduras, Nicaragua

Good morning!

We really appreciate the time you are taking to meet with us today. My name is _____ . We are from the Centers for Disease Control and Prevention in Atlanta, Georgia working with Red Cross doing an assessment of water, sanitation and hygiene practices here in _____.

We would like to talk about messages you may have heard many years ago after Hurricane Mitch around water, latrines, and hygiene practices like hand washing. We would like to know your thoughts about your water system, your latrines, and hand washing practices. We expect this interview to last around 45 minutes. The purpose of this session is to gather information that will help us improve recommendations for water systems, latrines, and hygiene education in communities just like your community. We encourage you to talk freely. Your information is very valuable to us. If you do not want to participate or if you have any problems with participation that is ok.

If you would like to participate, then I'd like to talk to the person that is responsible for preparing the food, takes care of the house and collects water for the home. During this interview, we will ask questions on three themes – water, sanitation, and hygiene practices. These questions will be open, so you do not have options from which to choose. Because I am the only one here doing this interview I would like to let you know that our conversation will be tape recorded. This interview will last about 45 minutes at the most.

Your honest answers and opinions will help us improve programs and services in all countries where we work and in your community. We believe that with your participation, this evaluation will be complete.

We ask your cooperation and would like to assure you that:

•Your participation is anonymous (your name will not be on the questionnaire and the results will be presented in general terms, not by person)

•Your participation is completely voluntary. You do not have to answer any question that you do not want to answer.

We appreciate your participation. Do you have any questions?

If you agree, let's start…….

Spanish Translation

¡Buenos Días!

Agradecemos su tiempo que está tomando para reunirse con nosotros hoy. Mi nombre es _____. Estoy aquí por parte de los Centros para el Control y Prevención de Enfermedades (CDC) y la Cruz Roja para realizar una evaluación de agua, saneamiento y prácticas higiénicas aquí en _____.

Nos gustaría hablar sobre los mensajes que usted tal vez ha oído hace muchos años atras, después del huracán Mitch acerca de agua, letrinas y de las prácticas de higiene como lavado de manos. Nos gustaría saber su opinión sobre su sistema de agua, sus letrinas, y las prácticas de lavado de manos. El propósito de esta sesión es lograr información que nos ayudará a mejorar las recomendaciones para los sistemas de agua, letrinas y educación sobre la higiene en las comunidades como la suya. Esperamos que usted hable

con nosotros libremente. Su información es muy valiosa para nosotros. Si no quieren participar o si tiene algún problema con la participación, está bien.

Si gustaría paricipar entonces, quiero platicar con la persona que se encarga de preparar la comida, cuidar la casa y que recolecta el agua para la casa. Durante esta entrevista le haremos preguntas sobre tres temas – agua, saneamiento y las practices higiénicas. Estas preguntas seran abiertas, osea que no tendran opciones de las cuales puede escoger. Por el hecho de que yo sea la única aqui haciendo la entrevista, le quiero informar que nuestra conversación sera grabada. Este entrevista durara a lo máximo 45 minutos.

Sus respuestas y opiniones francas nos ayudaran a mejorar los programas y servicios en todo los paises en que trabajamos y también en su comunidad. Creemos que con su participación, esta evaluación será más completa.

Le pedimos que coopere con nosotros y le aseguramos que:

- Su participación será anónima (su nombre no sera registrado) y los resultados serán presentados en general, y no por persona)
- Su participación en este estudio es completamente voluntaria. Usted no tiene que responder a cualquier pregunta si no quiere contestar.

Le agradecemos su participación. ¿Tiene algunas preguntas?

Si está de acuerdo, vamos a empezar ...

APPENDIX B

Key Informant Interview

English and Spanish

Central America Water and Sanitation Program Sustainability Evaluation and Qualitative Key Informant Interview

From approved
OMB No. 0920-0908[1]
Exp. Date 11/30/2014

DRAFT QUESTIONS

Central America Water and Sanitation Program Sustainability Evaluation:

In-depth Interview Guide (Feb 2012) Date: _____ day/month/year

Country: ☐El Salvador ☐Guatemala ☐Honduras ☐Nicaragua
Community: _____
Interviewer: _____ Start Time: _____ End Time: _____

INTRODUCTION/CONSENT

We really appreciate the time you are taking to meet with us today. My name is _____ and my colleague is _____. We are from the Centers for Disease Control in Atlanta, Georgia. We are working with the American Red Cross on a study to gather information about your water and sanitation services. We want to hear your thoughts, opinions and experiences with your water and sanitation services. We would like to talk you about what you think about the water service, your latrine and about any hygiene education you may have received in the past few years. The purpose of this study is to see how the water and sanitation systems are working in this community.

The Red Cross came to this community after Hurricane Mitch in 1998 and helped to put in a water system, build latrines, and give talks about hygiene education on hand washing, how to store water in your home and how to treat your drinking water.

[1] Public reporting burden of this collection of information is 1hour with an estimated average of 1 minute per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestion for reducing this burden to CDC/ATSDR Information Collection Review Office, 1600 Clifton Road NE, MS D-74, Atlanta, GA 30333; ATTN: PRA (0920-XXX)

Did you live in this community at that time? ** We can still do the interview even if you just moved here since you are using the water system and latrines now.

We expect this interview to last around 45 minutes. Would you like to be interviewed? If you are in agreement then can we sit someplace quiet so we can talk in private? I am going to tape record our conversation since it will be easier than writing everything down if that is ok with you.

**Lived here since Mitch? □yes □ no If "no", since when? _____year only.

Bulleted items are to be read to the study participant.

If "yes" then start with question 1, if "no" start with question 2.

1. Do you remember when the Red Cross came to your community after Hurricane Mitch; they asked if people wanted to participate in the construction of water and sanitation services and receive hygiene education.

   If "no" skip to question 2.

   If "yes", please describe for me any activities you or other family members were part of during that time related to the water system, the sanitation facilities and any hygiene education?

   - Did you help build the water system? Do you have access to water in your home now? Why/why not?
   - Did you help build your latrine? Do you have one that works now? Why/why not?
   - Do you remember any of the health education charlas? What were they about? Can you tell me what you learned?

2. I would like to ask you more details about three things-your water system, your sanitation system/latrine and any hygiene education.
   a. ***Let's start with your <u>water</u> service……..***

   <u>(Water service-access/quantity/cost/quality/participation in water committee)</u>

   Since you moved here (or since 2002) until now, what do you think about the way your water service is working?

   - Is there enough water for your needs?
   - What do you think about the type of water you receive-does it taste good, safe to drink?
   - Do you pay a water fee? What do you think about that?
   - Can you tell me about the water committee, do you think they do a good job with the water system?

b. Next I would like you to think about your <u>sanitation</u> service or latrine……
<u>(Sanitation-availability/access/functionality)</u>

Most homes in this community are supposed to have a latrine. If your home has a latrine can you tell me about it?

- What kind is it? Who uses it?
- Does it work/still use it?
- Any problems with it?

There are some homes in your community that don't have latrines. Why do you think they don't have latrines? Can you tell me about those homes/families?

c. ***Finally, I would like you to think about any <u>hygiene education</u> that you may have received since you came to this community (since 2002)……***

<u>(Hygiene education-hand washing charlas/practice/water use/water treatment/ latrine care)</u>

<u>If you started with question 1. Pre-2002</u>. Do you remember the Red Cross giving charlas on hygiene education? Do you remember the topics they covered?

- Hand washing? Water storage? Water use or treatment? Latrine care? Do you remember anything from those talks that you practice today?
- Do you think the hygiene education charlas are good?

<u>If you started with question 2. Post-2002</u>. Please tell about the person or group who has come to your community (<u>after</u> 2002) to give charlas on hygiene education? What did they talk about? What do you remember about their visit? Please tell me about any messages or campaigns you have heard on the radio, TV or newspaper.

- Hand washing? Water storage? Water use or treatment? Latrine care? What do you remember from those talks?
- Do you practice anything from those talks? Do you know if your neighbors learned the same things too?
- Do you think the hygiene education charlas work?

3. Overall, what would you change to make the water system, latrines and hygiene education better for this community?
4. What else would you like us to know?

Thanks so much for you time!

Spanish Translation

From approved
OMB No. 0920-0908[2]
Exp. Date 11/30/2014

Evaluación de Sostenibilidad del Programa de Agua y Saneamiento en América Central:
Guía de Entrevista detallada (Feb 2012) Fecha: _____ día / mes / año

País: □ El Salvador □ Guatemala □ Honduras □ Nicaragua

Comunidad: _____

Entrevistador: _____ Hora de inicio: _____ Hora de finalización: _____

INTRODUCCIÓN / CONSENTIMIENTO

Apreciamos el tiempo que está tomando para reunirse con nosotros hoy. Mi nombre es _____ y mi colega es _____. Somos de los Centros para el Control y Prevención de Enfermedades en Atlanta, Georgia. Estamos trabajando con la Cruz Roja Americana en un estudio para recopilar información sobre sus servicios de agua y saneamiento. Queremos escuchar sus ideas, opiniones y experiencias con sus servicios de agua y saneamiento. Nos gustaría hablar acerca de lo que piensa sobre el servicio de agua, la letrina y sobre todo la educación en higiene que haya recibido en los últimos años. El propósito de este estudio es ver cómo los sistemas de agua y saneamiento están funcionando en esta comunidad.

La Cruz Roja llegó a esta comunidad después del huracán Mitch en 1998 y ayudó a poner un sistema de agua, construir letrinas, y dar charlas sobre educación para la higiene en el lavado de manos, la forma de almacenar agua en su casa y la forma de tratar su agua potable.

¿Vivía usted en ese comunidad ese momento (1999-2002)? ** De todas maneras podemos hacer la entrevista, aún si usted se acaba de mudar aquí dado que está utilizando el sistema de agua y letrinas ahora.

Esperamos que esta entrevista dure unos 45 minutos. ¿Desea ser entrevistado? Si estámos de acuerdo, entonces podemos sentarnos en un lugar tranquilo para que podemos hablar en privado? Voy a grabar nuestra conversación si está bien con usted, será más fácil que escribir todo.

[2] La carga pública la notificación de esta recopilación de información es de 45 minutos con un promedio estimado de un minuto por respuesta, incluyendo el tiempo para revisar las instrucciones, buscar fuentes de datos existentes, reunir y mantener los datos necesarios y completar y revisar la recopilación de información. Una agencia no puede realizar o patrocinar, y una persona no está obligada a responder a una solicitud de información a menos que muestre un número de control OMB válido. Los comentarios sobre el estimado de tiempo o cualquier otro aspecto de esta recopilación de información, incluyendo sugerencias para reducir esta carga a los CDC / ATSDR Recolección de Información Oficina de Revisión, 1600 Clifton Road NE, MS D-74, Atlanta, GA 30333, Attn: PRA (0920-0908)

** Ha vivido aquí desde Mitch? □ Sí □ No Si no, ¿Desde cuándo? _____año solamente.

Lee los elementos con viñetas a los participantes del estudio.
Si contestó "Sí", entonces comenzar con pregunta 1, si "No" comienzan con la pregunta 2.

1. ¿Recuerda cuando la Cruz Roja llegó a su comunidad después del huracán Mitch? Ellos preguntaron si la gente querían participar de la construcción de servicios de agua y saneamiento y recibir educación en hygiene?

   Si "no", pase a pregunta 2.

   Si "sí", Puedes describer en qué actividades usted u otros miembros de la familia participaron en ese tiempo en relación con el sistema de agua, el saneamiento y la higiene y cualquier otro tipo de educación?

   - ¿Ayudó a construir el sistema de agua? ¿Tiene acceso al agua en su casa ahora? ¿Por qué / por qué no?
   - ¿Ayudó a construir la letrina? ¿Tiene una que funcione ahora? ¿Por qué / por qué no?
   - ¿Recuerda alguna de las charlas de educación de salud? De qué fueron las charlas? ¿Me puede decir lo que aprendió?

2. Me gustaría preguntarle más detalles acerca de tres cosas-su sistema de agua, el sistema sanitario / letrina y cualquier educación en higiene.

   a. Vamos a empezar con su servicio de <u>agua</u> ...
   (El servicio de agua-acceso/cantidad/calidad/precio/participación en el comité de agua)

   Desde que se mudó aquí (o desde el 2002) hasta ahora, ¿qué piensa usted sobre la forma en que el servicio de agua está funcionando?

   - ¿Hay suficiente agua para sus necesidades?
   - ¿Qué piensa usted sobre el tipo de agua que usted recibe- el sabor es bueno? Saludable para beber?
   - ¿Usted paga una tarifa por el agua? ¿Qué piensa de eso?
   - ¿Puede usted hablarme sobre el comité de agua, ¿cree que hacen un buen trabajo con el sistema de agua?

   b. Ahora me gustaría que usted piense acerca de su servicio <u>sanitario o letrina</u> ... ...
   (Saneamiento-disponibilidad/acceso/funcionalidad)

   Se supone que la mayoría de los hogares de esta comunidad tienen una letrina. Si su casa tiene una letrina, podemos hablar sobre eso? Entonces……

• ¿Qué tipo de lettrina es? ¿Quién la usa?
• ¿Funciona / todavía la utilizan?
• ¿Hay algun problema con la letrina?

Hay algunas casas en su comunidad que no tienen letrinas. ¿Por qué crees que no tienen letrinas? ¿Me puede decir acerca de los hogares / familias de las casas donde no hay letrinas?

c. Por último, me gustaría que pensara en cual quier tipo de <u>educación</u> de higiene que usted haya recibido desde que llegó a esta comunidad (desde el 2002) .....
(la educación sobre la hygiene-charlas sobre lavado de las manos/práctica/uso de agua/tratamiento de agua/atención a las letrinas)

<u>Si usted comenzó con la pregunta 1. Antes dé-2002.</u> ¿Recuerda que de la Cruz Roja dio charlas sobre educación para la higiene? ¿Recuerda los temas que ellos cubieron?

• Lavado de manos? Almacenamiento de agua? Uso del agua o el tratamiento? Cuidado de las letrinas? ¿Recuerda algo de esas conversaciones que usted pone en práctica hoy en día?
• ¿Cree usted que las charlas sobre educación en higiene son buena?

<u>Si usted comenzó con la pregunta 2. Despues de 2002</u>. Puede informarme de la persona o grupo que ha llegado a su comunidad (<u>después</u> de 2002) para dar charlas sobre educación en higiene? ¿De qué le hablaron? ¿Qué recuerda acerca de su visita? Por favor, dígame acerca de los mensajes o campañas que se han escuchado en la radio, la televisión o el periódico.

• Lavado de manos? Almacenamiento de agua? Uso del agua o ratamiento? Cuidado de las letrinas? ¿Qué recuerda de esas conversaciones?
• ¿Pone en práctica algo de esas conversaciones? ¿Sabe si sus vecinos aprendiéron las mismas cosas también?
• ¿Cree usted que las charlas en educación en hygiene son buenas?

3. En general, ¿qué cambiaría para que el sistema de agua, letrinas y educación en higiene mejore esta comunidad?

4. ¿Qué más le gustaría que supiéramos?

Muchas gracias por su tiempo!

APPENDIX C

MATRIX – ROLE OF THE WATER COMMITTEE

Country	Condition	Positive perceptions	Negative perceptions
NICARAGUA	MANAGEMENT OF FUNDS AND EFFECTIVENESS	They manage the funds appropriately They do a good job Each member of the committee has his/her own functions and they do their job consistently So far, we have not had any problems	Not all the members in the committee do a good job. Only some of them watch that we always have water in the tap. For the system to work appropriately, they need to be cleaning it regularly. If there is a pipe broken, we have to complain and then they do their job.
	KNOWLEDGE	Committee members were trained by ARC	
	MAINTENANCE	They do a good job in maintaining the water system. There is a "young man" in charge of maintaining the water system When something needs to be repaired they notified us and we pay an extra-fee to help them.	They will not do anything if we do not complain I really do not know what to say. There was a different plumber before and they changed him, I do not know why. This seems to be a continuous problem.
	COMMITMENT	I think that the young man that is in charge puts extra-money of his own to repair some damages	Last time, they said they were going to help us with latrines, but we got nothing. I think that we are not going to get anything this year because this is the committee's last year.
	COMMUNICATION	They are actively involved with the community and release important information during meetings	
	LEADERSHIP		Well, at the beginning we had water, but then the system stopped working and there was not a committee representing us to solve the problem

Country	Condition	Positive perceptions	Negative perceptions
HONDURAS	MANAGEMENT OF FUNDS AND EFFECTIVENESS	I am happy with the work that they have been doing My mom is in the committee and they do a good job even though funds are not sufficient The new committee is good, but some people complain about the last increase in the water fee. They are managing the water system very good. I have never had any problems in my home	Only the new gentleman, he is quiet, but before him all of them have been just thieves. It is like "the goose with the eggs of gold". They have stolen a lot of money. They only look for their benefit, not for the communities' benefit. I do not know what they do with the money. Every new president in the committee disappears with the money. It has always been like that. The same thing happens in every new committee. They should put a honest person in charge of the finances I do not think that they are doing a good job. Doing a good job is improving things and nothing has been improved. Instead, things are getting worse
	EQUITY	They manage the water with equality so that, new community members can have access to water	
	MAINTENANCE	They are always watching that the community is not going to run out of water, the cleaning of the system, and any problems with the water pump	They are always restricting the water, especially during the Holy week. They should clean the water system better.

Country	Condition	Positive perceptions	Negative perceptions
GUATEMALA	MANAGEMENT OF FUNDS AND EFFECTIVENESS	There was a good committee before the landslide. They used to work in the water tank I think that they are working in the same way as the last committee. I supposed that is not their fault if someday there is no electricity to pump the water.	
	MAINTENANCE	They are always watching the maintenance of the water system. If suddenly we do not have water, they investigate what happened and then, in 2 or 3 days the water is back to our homes If we stop receiving water, they investigate what the problem is. They have been working for almost 11 years They are in charge of everything. They watch if everybody has water at home. I always have water.	They do not apply chlorine consistently. They put chlorine in the tank today because they knew you were coming. We know when the water has chlorine because of the taste. I do not know what to say. They do not worry about the water system
EL SALVADOR	MANAGEMENT OF FUNDS AND EFFECTIVENESS	I think that everything is going well, but I never go to the meetings. My older son goes. We have not had any problems in the community, they are working. Yes, they do all their duties. They are working well. Yes, the water system is well managed and well maintained	There is envy everywhere and all of them work differently. The first committee was changed because of bad management of financial resources and dishonesty. One of them stole the money and then moved to the US. The new committee is better, but still some people comment about suspicious behavior
	MAINTENANCE	I am always with the committee and now there is a problem with the water pump, it seems that it is about to fail. The American red Cross used to come and supervise everything. Everything was working beautifully. Maintenance was good before the earthquake. Here the system works well. If they need to repair the system, they let us know in advance so we can store water.	
	COMMITMENT AND OWNERSHIP	They make a good job because the water system belongs to our community, is not a property of CARE or the local government.	