SOCIAL CAPITAL AND COMMUNITY HEALTH CLUBS IN HAITI

Jason Rosenfeld

A dissertation submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Public Health in the Department of Health Policy and Management in the Gillings School of Public Health.

Chapel Hill
2019

Approved by:

Leah Frerichs

Pam Silberman

Geni Eng

William Story

Darren Saywell

ABSTRACT

Jason Rosenfeld: Social Capital and Community Health Clubs in Haiti
(Under the direction of Leah Frerichs)

One challenge facing WASH programs is that water and sanitation infrastructure are generally collective goods, while WASH behaviors involve individual responsibilities nested within collective norms. Social capital is theorized to facilitate collective action and enhance the diffusion of WASH-related behavioral interventions by enhancing social cohesion and collective action.

We used a mixed methods study to assess the relationship between social capital and a Community Health Club (CHC) program. We conducted a secondary analysis of data from a quasi-experimental evaluation of a CHC program in Haiti and held six focus groups with program participants and implementers. We used multi-level linear regression models to determine the impact of the intervention on WASH knowledge, behaviors and social capital, and the influence of social capital on changes in WASH knowledge and behaviors. We used inductive and deductive methods to analyze qualitative data where participants identified and described the factors that influenced perceived changes in WASH behaviors and collective action.

Among intervention respondents, we measured significant increases in average WASH knowledge scores ($p<0.0001$), a marginally significant decrease in trust and social solidarity scores ($p=0.07$), and no effect on WASH behaviors. Baseline social solidarity scores were associated with a significant increase in WASH behaviors ($p=0.03$). We also found a marginally significant interaction between the intervention and participation scores on average WASH knowledge scores ($p=0.08$) and a significant interaction between the intervention and social solidarity scores on average hygiene index scores ($p=0.04$). Qualitatively, discussion participants noted how CHCs disseminated knowledge and promoted WASH behavior change and collective action in intervention communities, built strong social bonds based upon trust and a sense of social solidarity, and how CHCs used trust and social solidarity to influence behavior change and collective action.

As the first attempt to measure and document the relationship between social capital and a CHC intervention in Haiti, we find these results encouraging. Our results and framework describing the relationship between social capital and a CHC program advance our understanding of the relationship between social constructs and WASH behavior change programs generally, and should be utilized by CHC practitioners and evaluators to enhance program implementation and evaluation.

To my amazing wife and children who supported me throughout this journey.
Thank you for all your patience, love and encouragement…
'*I can't do this all on my own…*'

ACKNOWLEDGEMENTS

I would first like to thank Dr. Leah Frerichs for her patience and mentorship throughout this endeavor. I never would have completed this work without your consistent encouragement and thoughtful insights. Next, I would like to thank my director, colleague and friend, Dr. Ruth Berggren, for not only encouraging me to pursue this degree, but also for providing the necessary time and support to complete this degree while working full-time. To my colleagues in Haiti, Marie Ruthza Flavienne Vincent and Jude Francois, you inspire me. My passion for community health comes in part from your leadership and desire to see all Haitians lifted out of poverty through health education and community empowerment. To Blondel Joseph, Jacob Michel, Pierre Christelle Ciceron and Makenzy Bouloute, thank you for helping me collect the data for this research. Each of you was a vital member of this research team from whom I learned so much. To my colleagues at the Center for Medical Humanities & Ethics, thank you for three years of support and understanding as I worked to complete this program. Last, but certainly not least, to all of the CHC members, facilitators and supervisors in Haiti, thank you for your dedication to the Community Health Club program and for agreeing to participate in this research. You are my teachers and I hope that these Clubs and this research helps you realize your fullest potential. Together we can achieve so much: Zafe kabrit se zafe mouton!

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CATPCA	Categorical Principle Component Analysis
CHC	Community Health Club
CLTS	Community Led Total Sanitation
CMHE	Center for Medical Humanities & Ethics
DINEPA	*Direction Nationale de l'Eau Potable et de l'Assannisement* (National Directorate for Drinking Water and Sanitation)
JMP	Joint Monitoring Program
KAP	Knowledge, Attitudes and Practices
PAHO	Pan American Health Organization
PHAST	Participatory Hygiene and Sanitation Transformation
MDG	Millennium Development Goals
SDG	Sustainable Development Goals
SOCAT	World Bank Social Capital Tool
UNC	University of North Carolina
UNICEF	United Nations International Child Education Fund
USAID	United States Agency for International Development
UT Health SA	University of Texas Health Science Center at San Antonio
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

LIST OF DEFINITIONS

Collective Efficacy: the belief individuals within a group or community have about the extent they can control and influence things or take coordinated and interdependent action on issues that affect their neighborhoods. Conceptually similar to social capital, and oftentimes considered as a dimension of social capital

Community Engagement: more than active participation in a program or intervention, includes involvement in intervention design or implementation

Least Developed Country: low-income countries confronting severe structural impediments to sustainable development that are vulnerable to economic and environmental shocks and have low levels of human assets

Millennium Development Goals (MDG): eight goals with a target date of 2015 that formed the blueprint for international health and development programs agreed to by all the world's countries and all the world's leading development institutions.

Social Capital: a public good that is a by-product of social relationships and can generate positive externalities facilitating cooperation for achieving mutual goals. Social capital includes the tangible (financial, social, material) and intangible (trust, norms, knowledge/information) resources that individuals and groups have access to through their social networks. Is comprised of the concepts listed below:

> **Bonding Capital:** the network ties between people with common social identities and serves as a source of help and support. This can be operationalized as links between members of the same church, year of study at school or socio-economic status.
>
> **Bridging Capital:** the weaker, horizontal ties connecting people to different social networks, identities and characteristics. This can be operationalized as linkages or connections with people or groups outside of your church membership.
>
> **Cognitive Social Capital:** describes the quality of the relationships via trust and reciprocity
>
> **Collective Action:** where people join together to achieve a common, collective objective; action that a group takes together to enhance the group's status and achieve a common, collective objective. When individuals put their own self-interest aside and take action that has mutual benefit.

Linking Capital: the bridging, oftentimes vertical, ties between explicit, formal, or institutionalized power or authority gradients in society. This can be operationalized as linkages between a community organization and a government ministry.

Social Cohesion: the extent of connectedness and solidarity among groups. The absence of latent social conflict and the presence of strong social bonds

Structural Social Capital: related to social participation (civic engagement) and organizational affiliation

Sustainable Development Goals (SDG): the set of 17 goals as part of a new sustainable development agenda, and a continuation of the progress made under the MDGs, that call for action by all countries, poor, rich and middle-income to promote prosperity while protecting the planet.

WASH Collective Action: Individual and collective WASH practices, including hand washing, drinking water storage, defecation practices, kitchen hygiene practices and environmental management.

WASH Knowledge, Attitudes, and Practices (KAP): knowledge about WASH disease transmission (i.e., diarrhea, skin diseases, malaria) and preventive behaviors (i.e., when to wash hands, how to make an oral rehydration solution)

CHAPTER 1: BACKGROUND

Water, Sanitation and Hygiene (WASH)

Global access to clean water and safe sanitation has improved significantly since 1990, when the World Health Organization (WHO) and the United Nations Children Fund (UNICEF) began tracking global statistics (WHO & UNICEF, 2017). In 1990, global access to improved water sources (i.e., sources that are protected from contamination by nature of its construction or through active intervention), and improved sanitation facilities (i.e., facilities that hygienically separate human excreta from human contact) stood at 76% and 54%, respectively (WHO/UNICEF, 2015). In 2010, world leaders agreed to the Millennium Development Goals (MDG), which accelerated progress in the water, sanitation and hygiene (WASH) sector. As of 2015, 91% of the global population had access to an improved water source and 68% had access to improved sanitation facilities (WHO/UNICEF, 2015). We now have the Sustainable Development Goals (SDG), which seek to attain the goals of universal access to basic water (improved source with less than 30 minute collection time), sanitation (improved facilities that are not shared with other households), and hand washing services (hand washing facility with soap and water, available on premises) (WHO & UNICEF, 2017). Although our collective achievements under the MDGs were impressive, 844 million people remain without access to basic drinking water sources and 2.3 billion people remain without access to basic sanitation services, 892 million of whom continue open defecation (WHO & UNICEF, 2017). Furthermore, progress has been uneven, with least developed countries lagging behind and a growing disparity between urban and rural communities.

Haiti is a least developed country with a history of underinvestment in the WASH sector. From 1990-2015, access to basic sanitation increased from 18% to 31%, while open defecation decreased from 48% to 19%. Over the same time period, access to basic water services increased from 62% to 64% (WHO & UNICEF, 2017). These percentages remain well below the regional average for Latin America and the Caribbean, where access to basic sanitation increased from 67% to 86% and access to basic water increased from 73% to 86% over the 25-year period. Further, Haiti's rates (sanitation access at 31% and water access at 64%) are lower than the average for small island countries (sanitation access at 64% and water access at 82%), but comparable to those for least developed

countries (sanitation access at 32% and water access at 62%) (WHO & UNICEF, 2017). Haiti also faces disparities in access to water and sanitation between urban and rural communities that mirror global trends. In Haiti, urban communities have greater accessibility than rural communities to safe water sources (81% versus 40%) and sanitation facilities (37% versus 22%) (WHO & UNICEF, 2017). Natural disasters such as the 2010 earthquake, which destroyed water and sanitation infrastructure in Port-au-Prince and the surrounding communes, and Hurricane Matthew in 2016, which devastated the southern portions of the island, are partially responsible for this situation (Gelting, Bliss, Patrick, Lockhart, & Handzel, 2013).

Effects of Inadequate WASH

The impact of inadequate WASH is significant, affecting individual and collective health status, educational attainment, and economic growth. Approximately 4.2% of global morbidity is attributable to inadequate WASH, the majority of which is associated with infectious diarrhea, which disproportionally affects children under the age of five (Pruss-Ustun et al., 2014; Prüss-Üstün, Bos, Gore, & Bartram, 2008). In fact, diarrheal diseases kill more children under the age of five each year than HIV/AIDS, tuberculosis and malaria combined (Boschi-Pinto, Velebit, & Shibuya, 2008). In Haiti, lack of access to safe drinking water combined with high rates of open defecation after the earthquake contributed to the severity and rapid spread of a cholera epidemic. The epidemic began in October 2010 and resulted in 809,262 suspected cases and 9,568 reported deaths through the end of 2017 (Pan American Health Organization/World Health Organization, 2017). But the burden of WASH-related diseases goes beyond diarrhea (Cairncross et al., 2010; Fewtrell et al., 2005; Luby et al., 2004) and include acute respiratory infections (Luby et al., 2005), malnutrition (Clasen et al., 2014; Dangour et al., 2013; Humphrey, 2009; Ngure et al., 2014) and neglected tropical diseases (Freeman et al., 2013) such as trachoma (Stocks et al., 2014) and parasitic infections (Clasen et al., 2014; Esrey, Potash, Roberts, & Shiff, 1991).

This burden of disease has long-term effects on the human and economic potential of entire countries. The United Nations Development Program estimates that 443 million school days are lost every year, with approximately 272 million of those attributable to diarrheal diseases (Hutton, Haller, & Bartram, 2007). Further, inadequate WASH facilities at school contribute to 10-20% of absenteeism in young girls (McMahon et al., 2011; Sommer, 2010). Parasitic infections cause stunting and contribute to anemia, late entry to school, and impaired cognitive function (WHO, 2005). Chronic malnutrition, which is in part associated with chronic inflammation of the gut wall because of continuous exposure to fecal pathogens in the environment (i.e., lack of improved sanitation),

also affects cognitive function and school performance (Korpe & Petri, 2012; A. Lin et al., 2013; Ngure et al., 2014). Further, women and girls not only bear the majority of the time and energy burden associated with water and household sanitation, contributing to limited attainment of education and lost economic opportunities, but they also face the risk of violence during the long treks collecting water or when seeking privacy to answer nature's call (Pearson & McPhedran, 2008; Sorenson, Morssink, & Campos, 2011).

Inadequate human development in turn contributes to lower economic growth. The per capita GDP growth of poor countries with improved access to water and sanitation is much higher than that of equally poor countries without improved access (3.7% and 0.1%, respectively) (Hutton & Bartram, 2008). Finally, both households and health systems share the economic costs of this disease burden. The health costs amount to an estimated $340 million for households lacking water supply and sanitation and $7 billion for national health systems (Hutton & Haller, 2004). Unfortunately, these health and economic costs disproportionately affect poor and vulnerable households, reinforcing a vicious cycle of poor health, poverty, and underdevelopment.

WASH Strategies

The ultimate goal of WASH interventions are to contribute to a sustainable reduction in preventable WASH diseases. Typically, WASH interventions promote one or both of the following: (1) a technology (i.e., water pump, household filter, ecological latrine) and (2) regular and/or correct use of the technology through health promotion and behavior change (Hulland, Martin, Dreibelbis, DeBruicker Valliant, & Winch, 2015). The specific strategies vary according to the implementing agency, the donor and a country's strategic priorities. Improving access to safe drinking water and sanitation infrastructure can be accomplished by expanding access to large scale projects (i.e., water distribution systems or sewerage systems) or improving access to small-scale community or household-level technologies (i.e., hand pumps, household water treatment technologies, or community-based sanitation systems) (Hulland et al., 2015). While large-scale projects have the potential to serve greater numbers, they are more expensive than community or household-level interventions. In 2008, large-scale infrastructure projects accounted for over 60% of foreign aid directed for water and sanitation development in low- and middle-income countries, with the balance directed towards small-scale projects (Hulland et al., 2015). Although small-scale programs cost much less, they rely upon greater community engagement and well-designed behavior change initiatives to support initial adoption and sustained use of WASH technologies and behaviors.

WASH strategies that combine supply-side improvements with demand creation activities typically use health promotion, health education, and behavior change strategies. While the goals of supply-side improvements are obvious, WASH promotion interventions typically aim to do one or more of the following: 1) empower individuals, school children and/or entire communities with knowledge; 2) enable a change in behavior (including appropriate use and maintenance of sanitation facilitates; safe disposal of feces; proper hand washing; clean water use and storage and control flies and other insect vectors); 3) create demand for services; 4) facilitate the establishment of supply chains for water or sanitation; and 5) improve the planning and implementation of hygiene and sanitation projects (Brown, Cavill, Cumming, & Jeandron, 2012; Carr & Strauss, 2001; Peal, Evans, & van der Voorden, 2010). Billions of dollars have been invested in technical solutions to WASH. However, much less has been invested in health promotion approaches that address the social and institutional barriers to effective WASH programs (Esrey et al., 1991; Fewtrell et al., 2005).

Through the 1990's, WASH programs largely emphasized supply-side approaches and promotion and education were commonly an afterthought. However, these 'top-down' strategies were proven largely ineffective and have been replaced by more participatory, 'bottom-up' strategies that aim to educate, change behaviors, and create demand for water and sanitation services (Peal et al., 2010). Participatory Rural Appraisal was the first 'bottom-up' approach that aimed to empower participants to analyze their own felt needs and develop strategies to address those needs. In the 1990's, the Participatory Health and Sanitation Transformation (PHAST) approach, which uses a picture-based toolkit and a range of participatory activities to engage participants in discussion and stimulate behavioral changes, was widely adopted. By the late 1990's and early 2000's, there was a rapid increase in the development and adoption of innovative WASH promotion and behavior change interventions. These include the Hygiene Improvement Framework, the Community Health Club approach, School Sanitation and Hygiene Education, Community Led Total Sanitation, social marketing, and Total Sanitation and Sanitation Marketing, to name a few (Peal et al., 2010). While each strategy focuses on different outcomes (e.g.; ending open defecation, improving hand washing practices, reducing diarrheal diseases), utilizes different methods (e.g., disgust as a trigger, collective problem solving, participatory education) or targets different populations (e.g., children, women, entire communities), all aim to dissemination information, encourage behavioral changes and generate demand for improved WASH infrastructure.

Tragedy of the WASH Commons

One of the unique challenges of WASH programs is that water and sanitation infrastructure are generally collective goods, while WASH behaviors are a combination of individual responsibilities nested within collective norms, values and culture (Dreibelbis et al., 2013). This can lead to what has been characterized as the 'tragedy of the commons' where individuals behave in narrow, self-interested ways related to their use, investment in, and protection of collective goods (Hardin, 1968; Kähkönen, 1999; McGranahan, 2015; Winters, Karim, & Martawardaya, 2014). In other words, communities are unable or fail to take collective action, where people join together to achieve a common, collective objective (Olson, 1965). For water, individuals have little incentive to contribute to the construction, operation and maintenance of water services because it can be difficult to exclude or penalize those who do not contribute to or participate in the construction or operation of a water point. This issue has a slight twist with sanitation. The incentives for individuals to construct a latrine are low if the rest of a community continues to openly defecate, since the risk for exposure to fecal matter will remain the same (McGranahan, 2015). Finally, WASH behaviors are not determined solely by individual, rationale choice, but rather shaped and constrained by a complex mixture of individual, social, and environmental factors (Jeyakumar & Ghugre, 2017; WASHplus, 2016; Webb et al., 2006). As a result, one individual alone might find it difficult to change their hand washing or defecation practices unless the wider community applies social pressure, sanctions or stigmatizes individuals in an effort to force behavioral deviants to adhere to a common healthy practice.

This tragedy of the WASH commons, or the WASH collective action problem, can be overcome by designing interventions that increase community engagement and enhance community cohesion (Ostrom & Ahn, 2007). Community engagement is more than active participation in a program or intervention, and includes involvement in intervention design or implementation, while social cohesion refers to the extent of connectedness and solidarity among groups (Kawachi & Berkman, 2000). Both have been identified as essential components of successful community-based health promotion and WASH programs (Barrington et al., 2016; Campbell & Jovchelovitch, 2000; Shakya, Christakis, & Fowler, 2014). Community engagement and the resulting social interaction helps shape attitudes and beliefs, thereby contributing to community-based behavior change efforts (Campbell & Jovchelovitch, 2000; Campbell, MacPhail, C, & C, 2002). Unfortunately, few WASH programs have implemented or evaluated theory-based strategies that aim to improve community engagement, social cohesion and ultimately, collective action.

Social Capital

Social capital is a complex, multi-dimensional concept with roots in political science and sociology, for which experts have yet to agree upon a standard definition (Bourdieu, 1986; Coleman, 1988; Putnam, 1995). It is broadly agreed that social capital is a by-product of social relationships and that it is a public good that can generate positive externalities, which facilitate cooperation for achieving mutual goals (Eriksson, 2011; Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997; Schuller, Baron, & Field, 2000). Like human and physical capital, social capital is theorized as a communal asset that can be accrued or lost and can generate future benefits (Ostrom & Ahn, 2007). However, social capital also has the potential to create negative consequences, including exclusion of outsiders (homogenous groups that exclude those outside the boundaries of their ethnic, religious, or economic descriptors), excess claims on and expectations of group members (overburdening members of the group by asking them to do too much), restrictions on individual freedoms (demands for conformity can lead to a loss of individual freedom), and downward leveling norms (a belief that things cannot change, resulting in reduced expectations and maintenance of the status quo) (Portes, 1998).

The empirical literature is split into those who treat social capital from a network perspective (structural social capital) and those who define the concept from a social cohesion (cognitive social capital) perspective (Harpham, Grant, & Thomas, 2002; Kawachi et al., 2010). Although there is widespread agreement that both approaches are necessary, the majority of research on social capital and public health has emphasized the social cohesion approach (Spencer Moore, Shiell, Hawe, & Haines, 2005). The network perspective of Bourdieu and Coleman emphasizes the resources that are embedded within an individual's social network (Carpiano, 2008). This perspective refers to an individual's actions and behaviors, in particular the composition and extent of engagement in group and social network membership, and the resources embedded within those networks (Harpham et al., 2002). The literature operationalizes structural social capital as group membership and social networks, which itself is comprised of bonding, bridging and linking capital. Bonding capital describes the network ties between people with common social identities and serves as a source of help and support. Bridging capital describes the weaker ties connecting people to different social networks, identities and characteristics, while linking capital describes the bridging ties between power hierarchies (Harpham et al., 2002).

The social cohesion perspective, or cognitive social capital, is less tangible. First offered by Putnam, this perspective views social capital as a group concept that individuals can take advantage of and focuses on the

resources available to the group like trust, reciprocity, and other norms (Kawachi et al., 2010; Putnam, 1995). The social cohesion perspective emphasizes the contextual influences of the collective exerted on the individual (Kawachi & Berkman, 2000). Putnam (1995) theorized that communities with greater stocks of generalized trust, civic engagement, and reciprocal norms would be more likely to have positive economic, political and social outcomes. If structural capital is what people do, then cognitive social capital describes how people feel (Harpham et al., 2002).

Social Capital and Health

Social capital has been a key concept in public health and social epidemiology for 20 years (Moore & Kawachi, 2017). In general, the evidence suggest that individuals with more social capital have better health and live longer (Kawachi, Subramanian, & Kim, 2008; Murayama, Fujiwara, & Kawachi, 2012). The results of a recent meta-analysis suggest that there is a strong, positive association between social capital and self-rated health and mortality (Gilbert, Quinn, Goodman, Butler, & Wallace, 2013). Further, social capital has been empirically linked to a number of health and health-related outcomes, including improved child development and well-being (Keating, 2000), improved mental health (Bullers, 2001; Kawachi & Berkman, 2001; Lin, Ye, & Ensel, 1999), lower violent crime rates (Hagan, Merkens, & Boehnke, 1995; Sampson, Morenoff, & Earls, 1999), reduced mortality (Kawachi et al., 1997), and higher perceived well-being and self-reported health status (Ellaway & Macintyre, 2000; Helliwell, 2003; Kawachi, Kennedy, & Glass, 1999; Raphael et al., 2001; Sevigny, Belanger, & Sullivan, 1999). Unfortunately, the majority of this research has focused on communities in high-income, western countries and cultures. There is comparably less research that has explored social capital and health in low and middle-income countries (Agampodi, Agampodi, Glozier, & Siribaddana, 2015; Story, 2013). What does exist is of varying quality, but in general the evidence suggests that social capital is an important factor for improving health outcomes in low- and middle-income countries (Story, 2013). While it appears that the link between social capital and health is well established, there are those that remain skeptical. These authors argue that a focus on social capital distracts from other more important factors like poverty and structural racism, can be used to blame the victim, and that social capital can be used to reinforce negative social hierarchies (Mohan & Mohan, 2002; Mohan & Stokke, 2000; Veenstra et al., 2005).

There are four primary mechanisms through which social capital influences health outcomes: perceived ability of a group to undertake collective action (collective efficacy); informal social control (enforce and maintain social control); through reciprocity exchanges; and diffusion of innovations and information via social networks (Kawachi et al., 2010). Higher levels of social capital are thought to facilitate collective action by lowering the costs associated with such action and by reducing the problem of free riding, or obtaining a benefit at the expense of others (Cameron, Olivia, & Shah, 2015; Casey, Glennerster, & Miguel, 2012). Social capital also facilitates the transmission of knowledge about other's behaviors and reduces problems of opportunism, thereby enhancing the effectiveness of behavior change programs (Cameron et al., 2015).

However, the mechanisms by which social capital influences health outcomes appear to differ depending upon the level at which social capital is measured: individual or collective. Social capital is theorized to influence health outcomes at an individual level through social influence, social engagement and exchanges of social support, while at a communal level social capital is theorized to influence health outcomes through collective socialization, collective efficacy and informal social control (Berkman & Glass, 2000; Cohen, Underwood, & Gottlieb, 2000). Two systematic reviews have noted that the strongest associations are between individual measures of social capital and health, while the relationship between collective or community social capital and health are inconclusive (Islam, Merlo, Kawachi, Lindström, & Gerdtham, 2006; Kawachi et al., 2008). More research is required to understand the mechanisms and elucidate the connections between health outcomes and social capital as measured at the individual and collective levels.

Social Capital and WASH

Social capital is theorized to facilitate collective action among households and voluntary compliance with communal rules, thereby addressing the tragedy of the WASH common's or collective action problem (Isham & Kahkonen, 2002). Further, through enhanced trusting relationships via an expanded social network, social capital potentially enhances the diffusion and adoption of water-related behavioral interventions (Bisung, Elliott, Schuster-Wallace, Karanja, & Bernard, 2014). It is theorized that communities with higher social capital can more rapidly diffuse information about the beneficial effects of improved hygiene practices and more effectively enforce collective hygiene norms (Bakshi, Mallick, & Ulubaşoğlu, 2015; Berkman, Glass, Brissette, & Seeman, 2000). The

levels of social capital in a community, prior to the implementation of a WASH intervention, have been documented to effect the success of WASH interventions (Cameron et al., 2015; Isham & Kahkonen, 2002; Kähkönen, 1999).

The relationship between social capital and WASH has important implications for how to select communities for interventions and intervention design in communities with low social capital. This is especially important for least developed countries where levels of social capital might be low due to social disruptions and population displacements caused by reoccurring disasters and a culture of dependency fomented by decades of poorly designed development interventions. Since some evidence has suggested that pre-existing levels of social capital are necessary for the eventual success of community-based WASH programs, there may be a low probability of success in communities where social capital is low or non-existent (Bisung et al., 2014; Cameron et al., 2015; Isham & Kahkonen, 2002; Isham & Kähkönen, 1999). Thus, some have argued that communities with high social capital should be prioritized over those with low social capital or that community-building activities must be implemented prior to the WASH intervention (Cameron et al., 2015; Isham & Kahkonen, 2002). However, communities with the lowest social capital may have the most need and preparatory community-building activities may take too long or be ineffective if not well integrated with WASH. The Community Health Club model is a community-based WASH program based upon social capital theory, which the originators of the model claim was designed to overcome these challenges.

Community Health Clubs

The Community Health Club (CHC) model is a participatory, community-based WASH promotion program developed and field-tested by the ZimbabweAHEAD organization from 1994 to 1997. CHCs are voluntary, community-based organizations that provide a forum for the dissemination of preventive health information and opportunities for consensus building and collective behavior change (Waterkeyn, 2006). This CHC model is designed to alter WASH practices and create demand for water and sanitation infrastructure by promoting community cohesion (Waterkeyn & Cairncross, 2005). Dr. Juliet Waterkeyen and the Zimbabwe AHEAD organization developed this participatory health promotion model in response to shortcomings of the PHAST methodology. While PHAST was effective in raising awareness and increasing knowledge about drinking water, defecation and hand washing practices, it failed to produce expected WASH behavior change or stimulate WASH collective action (Malebo et al., 2007). The CHC model aims to bridge the gap in WASH knowledge and behaviors by creating a peer group dedicated to improving the health of their community (Waterkeyn, 2006; Waterkeyn &

Cairncross, 2005). Since 1994, over 2,000 CHCs have been formed, benefiting over 1 million people across Africa, Asia and the Caribbean. Across social, cultural, and geographical contexts, the CHC model has demonstrated impact on WASH knowledge and behaviors (Azurduy, Stakem, & Wright, 2007; Brooks, Adams, Bendjemil, & Rosenfeld, 2015; Niaone, Bendjemil, Rosenfeld, & Berggren, 2016; Rosenfeld & Taylor, 2015; Waterkeyn & Waterkeyn, 2013).

Theory

CHC theory and practice has been described in more detail elsewhere (Brooks et al., 2015; Waterkeyn, 2006; Waterkeyn & Waterkeyn, 2013; Waterkeyn & Cairncross, 2005). CHCs provide a forum for experiential learning, discussion, and problem solving that is rooted in Paolo Freire's concepts of *conscientisation*, the process of becoming a critical thinker, and *praxis*: 'reflection and action upon the world in order to transform it' (Freire, 1970). The model draws upon multiple behavioural theories, including the Health Belief Model, the Theory of Reasoned Action and Planned Behaviour, and Social Learning Theory, and is set within the conceptual frameworks of participatory development and social capital (Waterkeyn & Waterkeyn, 2013; Waterkeyn & Cairncross, 2005).

The model recognizes that knowledge is necessary for WASH behaviour change, but not sufficient. CHCs provide a venue for people to explore their individual and collective knowledge using participatory health education techniques. These techniques allow people to engage with new ideas, comparing these ideas with current knowledge and practice. This process of self-discovery, rather than transfer of knowledge through expert advice, is essential to the creation of new knowledge. However, appealing to individual rationale through cognitive learning and knowledge creation does not often lead to behaviour change. The CHC model theorizes that social pressure and group conformity are more potent forces of change, and therefore seeks to stimulate behavior change through a calculated use of group dynamics.

CHC's aim to facilitate changes in communal norms and values by promoting community cohesion, creating collective knowledge, and building group consensus. The peer group, the CHC, is the vehicle through which these objectives are achieved. The group shares a social identity, meets regularly (weekly for six months or longer) and is dedicated to learning and social action. These regular meetings, where knowledge is shared and action is taken, aim to develop self-and collective-efficacy. Increased efficacy provides members with the confidence to challenge existing cultural practices, agree upon alternatives, and implement new practices. Thereafter, the members

use social pressure, social support, and social action to facilitate changes in and maintenance of new communal norms and values. As the peer group changes wider social norms and practices, it becomes easier for each individual to change their behaviors to match those of the wider social group. Through participation in this group and the dynamics that the group creates, individuals are able to expand their social networks, increase real and perceived trust of their neighbors and wider community, and create new norms of reciprocity and social engagement. The group is then able to utilize informal social control to ensure adherence to newly established practices. In this way, it is possible for communities to change long-standing communal norms and practices within a six-month period, rather than over generations.

Implementation

Trained peer facilitators are responsible for forming CHCs and leading the health education sessions. For a socially intensive model like CHCs, it is necessary that the individual responsible for leading discussions and building group consensus is a peer and neighbour. The only criteria that community leaders are given when choosing peer facilitators is that the individuals should be literate, well known and respected members of the community. Oftentimes, community leaders choose individuals who already serve their community as trained community health workers, but this is not a requirement. The most successful facilitators are those that are near peers to the majority of the CHC members, removing potential power differentials. Further, peer facilitators are typically more effective conduits of information than more distal health professionals and community health workers. After community selection, the peer facilitators complete a one-week training course on CHC theory, basic facilitation techniques, and the participatory WASH curriculum.

The WASH curriculum consists of 23 topics (Appendix 1), and is designed so the members learn new information that builds upon the previous week's lessons. CHC members meet for up to two hours with their trained peer facilitator on the same day, at the same time and venue, every week for six-months. To accommodate low literacy levels, and allow for the use of fun and engaging participatory learning activities, the facilitators implement the WASH curriculum using a picture based toolkit. This toolkit is tailored for each specific country and context, and the images are hand drawn by local artists. The curriculum draws upon principals of experiential and adult learning, which assumes that everyone has knowledge. Therefore, the role of the facilitator is not to teach, but to encourage participation, draw out information, and stimulate fruitful discussion. Each week or topic requires the

facilitator to lead a participatory activity, game or discussion using between 10 to 20 images (Appendix 2). These activities include three pile sorting, blocking the route, and storytelling. Songs, dramas and role-playing are additional learning techniques commonly used in the WASH curriculum. See Appendix 3 for a full list and description of these activities

The members enter into a social contract where they expect each other to attend every meeting for the entire six months. This ensures that everyone has complete knowledge at the conclusion of the program, but is also essential to achieving behavior change. At the conclusion of each meeting, CHC members agree upon one new practice that they have learned and will implement before the next meeting. This homework, or recommended practice (see Appendix 1), is an essential part of the behaviour change process. Three simple to execute and observable practices commonly adopted by CHC members include storing drinking water in buckets with a tight fitting lid, placing a homemade hand washing facility, with soap, outside the home or near the latrine, and constructing an outdoor rack to dry pots and dishes. Therefore, members are encouraged to attend every meeting not only to ensure complete knowledge, but also to ensure everyone has a voice in the selection of new practices. The program builds social accountability into the design, as the CHC members, with support from the peer facilitators, are encouraged to conduct household visits and record behavioural changes using a simple to use household checklist.

Table 1: Examples of CHC names & slogans

Country	CHC Names	CHC Slogans
Haiti	*Lakou Lape Club Santé Communitaire* (Peace Garden)	*100% la Sante* (100% Health)
Dominican Republic	*Club de Salud de Vida y Paz* (Life and Peace)	*¡Salud Primero Antes Todo!* (Health First Before Everything)
South Africa	*Buhlebezwe Community Health Club* (Beauty of the Nation)	*Vukamawulele!* (Rise Up From Your Sleep!)

The CHC model has an emphasis on forming a new social identity around health that differentiates it from other community-based health education models. Every CHC creates a club name, slogan and song, which help form and reinforce this social identity (Table 1). The CHC name is intended to be creative and aspirational, while the slogan is intended to be a mission statement. The slogan is often used as a call and response by the facilitator at the beginning and end of the weekly meetings. Finally, the songs are a fun manifestation of each CHCs key messages. Oftentimes CHC songs focus on specific aspects of WASH such as hand washing, but they generally describe the

importance of health, health equity, collective action, and social cohesion. This social identity is essential to the success of the program and provides the catalyst for much of the social change that occurs through the CHC model.

The model was designed as a longitudinal program, where a variety of health topics and activities can be introduced once the CHC is formed. As the CHC members learn to work together, building confidence in their ability to create consensus and solve local problems, they are eager to continue their learning and take on additional, oftentimes more complicated challenges in their community. Only those members that successfully complete prior phases or health topics are eligible to continue with subsequent curricula or program phases. CHC members agree to this criterion to reduce the threat of 'gate crashers', or those who wish to participate in the intervention only to receive material goods. The first phase or topic is typically the six-month WASH curriculum. Thereafter, most CHCs move into WASH infrastructure provision. However, since the model aims to encourage communities to explore self-supply of water and sanitation infrastructure or to advocate with service providers, WASH infrastructure provision oftentimes begins before the six-month WASH curriculum is completed. Thereafter, CHCs move on to other self-identified and prioritized topics and activities, which have included income generation and livelihoods, food and nutrition, HIV prevention and social support, and reproductive and sexual health.

Study Context

CHCs have been implemented in Haiti since 2012, through a partnership between the Center for Medical Humanities & Ethics (CMHE) at the University of Texas Health San Antonio (UT Health SA) and the Eco-Eau et Jeunesse (Water & Youth) Haiti (EEJ) organization. Together, these organizations have created the Lakou la Santé foundation, a non-profit registered in Haiti dedicated to the dissemination and evaluation of the CHC model in Haiti. The goal of this program is to address the unnecessary burden of preventable morbidity and mortality in impoverished Haitian communities by creating community-based social structures equipped with the knowledge, skills and capacity to develop partnerships, sustain health gains and manage community development initiatives. To date, Lakou la Santé has trained over 150 peer facilitators across six communes in Haiti, including Port-au-Prince, Croix de Bouquets and Mirebalais, resulting in the formation of over 130 CHCs, benefiting an estimated 33,000 people.

The purpose of this research was to continue to build evidence about the impact of CHCs, the mechanisms through which CHCs achieve impact, and understand the relationship between social capital and the CHC model.

While the CHC model is theorized to stimulate social capital, no empirical studies have explored this relationship. Specifically, this study used a quasi-experimental mixed methods design to evaluate CHCs in rural Haiti focused on WASH in order to understand the relationships between community engagement, social capital and program outcomes. We explored the effect of CHCs on social capital, and whether pre-intervention social capital altered the intervention's impact on WASH knowledge, behaviors and collective action. We used quantitative and qualitative methods to improve our understanding of the pathways through which social capital is created by CHCs and to determine whether social capital influences knowledge and behavioral outcomes, and if so, in what ways. Specifically, this study aimed to answer the following research question and specific aims.

Research Question

What are the relationships between social capital and a Community Health Club (CHC) program in Haiti focused on water, sanitation and hygiene?

Specific Aims

- Identify the effect of the CHC program on community member social capital and WASH knowledge and behaviors after a one-year intervention.
    a. Hypothesis 1a (H1a): Intervention respondents will have significantly greater increases in social capital, WASH knowledge, and WASH behaviors after a one-year intervention than respondents in comparison communities.

    b. Hypothesis 1b (H1b): Intervention respondents will have significant increases in WASH knowledge and behaviors, independent of baseline social capital, after a one-year intervention.

- Examine the mediation effects of social capital on CHC participant's WASH knowledge and behaviors.
    a. Hypothesis 2 (H2): Social capital will partially mediate the effect of the intervention on respondent WASH knowledge and behaviors.

- Describe participant and implementer perceptions of how social capital influences community engagement in the intervention as well as WASH knowledge, behaviors, and collective action.

CHAPTER 2: LITERATURE REVIEW

We conducted two separate literature reviews, with different purposes. The purpose of the first review was to explore the empirical evidence describing the relationship between social capital and WASH infrastructure management or behavioral interventions. We designed the second review to describe the CHC model and the empirical evidence of the model's impact on WASH outcomes and social capital. We describe the methods, results and a synthesis of findings for each review.

Literature Review 1: Social Capital and WASH

Methods

We conducted a review of the social capital and WASH literature using the PubMed, Global Health, Web of Science and PsychInfo electronic databases. We identified additional studies and manuscripts through expert recommendations and by mining the citations of relevant articles discovered through the database search. The search terms for our database search strategy are provided in Table 2.

Table 2: Social capital & WASH literature review search terms

Concept	Key Words/Search Terms
Social Capital	"social capital" OR "Social Capital"
AND	
Water, Sanitation & Hygiene (WASH)	"water" OR "sanitation" OR "hygiene" OR "WASH" OR "WaSH" OR "WatSan" OR "WATSAN" OR "water and sanitation"

Table 3 provides the inclusion and exclusion criteria for this review. For social capital, studies that focused on or referenced specific dimensions or constructs, such as trust or social networks, were not included. Only those manuscripts that used social capital as a key word, even if they only analyzed specific constructs, were included. Further, the review of the WASH literature focused specifically on drinking water and sanitation (toilets or latrines) infrastructure or behavior change interventions or programs, and hygiene practices, interventions or programs. Finally, only manuscripts describing research from developing or low and middle-income countries were included in this review. Therefore, in the Global Health database, the search was narrowed to only include 'developing countries', 'Africa', 'Asia' and 'Latin America'.

Table 3: Social capital and WASH literature review inclusion & exclusion criteria

Inclusion Criteria	Exclusion Criteria
Reference social capital specifically, not a single dimension or construct such as trust or networks	Reference a single dimension or construct associated with social capital
Drinking water and sanitation infrastructure or behavior programs or interventions AND hygiene practices, interventions or programs	Water resource management, irrigation schemes or environmental resource management programs and interventions
Developing or low and middle-income countries	Developed or high-income countries
Provide empirical evidence of a relationship between social capital and WASH collective action or behaviors	Theoretical discussion or theoretical modeling, without empirical evidence
Books, book chapters, peer reviewed literature, white papers or grey literature	Published in any language other than English
Published in English	

Results

The primary search strategy yielded 515 citations, with an additional four (4) citations obtained from expert recommendations and citation mining of relevant manuscripts. After removing duplicates, 505 records remained, which we reviewed by title, abstract and keywords for inclusion/exclusion criteria. This resulted in the exclusion of 486 records, and we completed full text review of 29 records. We excluded an additional 20 records after full text review. Nine (9) articles met the inclusion criteria and were included in this review.

The literature in this review suggested that there is a relationship between social capital and WASH. In general, all studies found a positive relationship between social capital and WASH infrastructure management, collective action or adoption of hygiene behaviors. Four of the studies focused specifically on engagement or participation in the construction, operation, or management of drinking water sources (Isham & Kahkonen, 2002; Person et al., 2017; Prokopy & Thorsten, 2008; Shrestha, 2013); two studies focused on both drinking water and sanitation (Bisung et al., 2014; Kähkönen, 1999); one study focused only on latrine construction and defecation practices (Cameron et al., 2015); and one study focused on hygiene behaviors (Bakshi et al., 2015). As with the broader social capital literature, there is inconsistency in how authors measured social capital. Some studies used validated survey tools that comprehensively measure both cognitive and structural social capital, while others used specific social capital dimensions or proxy measures. Only two of the nine papers empirically assessed the relationship between social capital and a WASH intervention.

Drinking Water Infrastructure

A World Bank study found that communities in Indonesia with active village groups and associations (i.e., structural social capital – group membership) were more likely to participate in the design of water systems and to implement communal monitoring mechanisms (Isham & Kahkonen, 2002). Further, communities with high levels of social capital prior to implementation of a drinking water system were more engaged in the design, construction, operation, and maintenance of community-based water projects, improving the overall impact of such projects. Prokopy and Thorsten (2008) found that social capital was positively associated with participation in a rural water supply program in Peru, but that bonding social capital was more important than bridging social capital. A similar finding was reported in a study from Nepal, where the authors determined that both bonding and bridging social capital were associated with a community's success in securing external funding for community-based water projects (Shrestha, 2013). Finally, the results of a study from Ethiopia suggested a possible relationship between social capital and water point governance, but offered no definitive evidence (Person et al., 2017). While all six domains of social capital measured by Person et al (2017) had a positive association with water point governance, only the information and communication domains were statistically significantly associations. The authors found no observable relationship between social capital and water point functionality (e.g. is the water point currently working as designed; how long has the water point been working properly).

Water & Sanitation Infrastructure

In an early review of successful water and sanitation service delivery programs, the evidence indicated that the existence of other, non-water and sanitation related, groups or networks combined with mutual trust amongst users, aided collective action (Kähkönen, 1999). Importantly, a community's pre-existing social networks, norms, trust and interaction amongst neighbors were important factors related to the overall performance of water and sanitation systems. Bisung et al (2014) set out to establish whether social capital was a pre-condition for environmental collective action in a community-based water and sanitation program in Kenya. This study found group membership and trust were significantly associated with participation in WASH collective action. The authors concluded that social capital might be necessary, but not sufficient for improving access to water and sanitation.

Sanitation and Hygiene Behaviors

In a study assessing the relationship between social capital and defecation practices under a Community Led Total Sanitation (CLTS) program, the authors found that communities with high social capital were more

successful in building toilets and reducing open defecation (Cameron et al., 2015). The authors also observed that reductions in open defecation reduced the burden of diarrhea in children under the age of five. Communities with high pre-existing social capital were successful in stimulating behavioral changes due to their ability to apply social sanctions. Further, the authors noted that the intervention successfully generated social capital, but only in those communities with high levels of pre-existing social capital. Another study explored the relationship between social capital and selection of key WASH behaviors (Bakshi et al., 2015). After controlling for a range of variables, the authors reported a significant, positive relationship between social capital and use of a sanitary latrine, and wearing sandals at home, but no impact on hand washing with soap after defecation.

Synthesis

The literature describing the relationship between social capital and WASH programs is small. Interest in the relationship between social capital and the effectiveness of WASH programs began with the World Bank in the late 1990's in response to the growing evidence base that social capital contributes to sustainable development. Although limited, the available literature demonstrates that social capital, which facilitates social cohesion and collective action, plays an important role in various aspects of WASH programs and infrastructure delivery systems. Importantly, pre-existing levels of social capital, most importantly membership in community groups and generalized communal trust are important pre-requisites to successful WASH programs. In fact, three of the nine papers in this review recommended that WASH program planners either avoid or develop pre-WASH implementation interventions for communities with low levels of social capital. Only one paper contradicted this recommendation and urged WASH practitioners not to overlook communities with low social capital.

The major findings from this review are summarized by Bisung and Elliot (2014), who developed a conceptual framework theorizing how social capital mediates outcomes in WASH programs. They argue that social capital can lead to improved health outcomes by facilitating collective action around water and sanitation facilities and by enhancing behavioral interventions through improved knowledge, attitudes and behaviors. Social capital, via enhanced trust, shared norms and expectations, and community engagement via groups and social networks, lead to improved social cohesion and collective action around the construction, operation, maintenance and long-term sustainability of community-based water and sanitation infrastructure. Further, the social environment shapes individual WASH behaviors by shaping communal norms, enforcing social control and sanctioning perceived negative behaviors. Evidence demonstrates that social networks, norms and group participation can influence

individual behaviors as well as adoption of behavioral interventions like water treatment (Bisung & Elliott, 2014; Wood, Foster, & Kols, 2012).

Literature Review 2: Community Health Clubs

Methods

Table 4: CHC literature review search terms

Concept	Key Words/Search Terms
Community Health Club	"Community Health Club" OR "Health Club"
AND	
Water, Sanitation & Hygiene (WASH)	"water" OR "sanitation" OR "hygiene" OR "WASH" OR "WaSH" OR "WatSan" OR "WATSAN" OR "water and sanitation"

We conducted a review of the CHC literature using the PubMed, Global Health, Scopus and Google Scholar electronic databases. We identified additional studies and manuscripts through expert recommendations and by mining the citations of relevant articles discovered through the database search. The search terms for our database search strategy are provided in Table 4.

Table 5: CHC literature review inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Reference CHCs specifically	Papers, documents, or citations that duplicated or reported data that had been previously reported or presented
CHC Intervention was focused on water, sanitation and hygiene	Focus of the CHC intervention was on a topic other than WASH
Developing or low and middle-income countries	Developed or high-income countries
Provide empirical and/or anecdotal evidence of the impact of a CHC intervention on WASH or social outcomes	
Peer reviewed literature, white papers, grey literature, conference proceedings and papers, dissertations, and advocacy pieces	
Published in English	

Table 5 provides the inclusion and exclusion criteria for this review. Studies that described or evaluated CHC interventions focused on WASH were included. Due to the limited evidence available describing the impact of CHC WASH interventions, this review included published papers, reports, conference proceedings and other documents with both empirical and anecdotal evidence. If several citations referenced or reported the same evaluation data, we retained the document that reported the data first and excluded all other citations. For example, the Water and Sanitation Program from the World Bank published a report describing the CHC intervention in

Zimbabwe, but Dr. Waterkeyn previously published the same data in Social Science and Medicine. Therefore, we excluded the World Bank report from the review.

Results

The search strategy yielded 155 citations, and after removing duplicates, 149 records remained. We reviewed the title, abstract and keywords of the 149 records against our inclusion criteria, which resulted in the exclusion of 102 records. Thus, a total of 47 records underwent full text review, and 28 records were excluded. Nineteen (19) articles met the inclusion criteria and were included in this review. The final 19 articles included a mixture of peer reviewed articles, conference and working papers, and advocacy documents. Five of the articles were either peer reviewed research articles (Brooks et al., 2015; Sinharoy et al., 2017; Waterkeyn & Waterkeyn, 2013; Waterkeyn & Cairncross, 2005; Whaley & Webster, 2011) or conference papers and/or proceedings (Maksimoski & Waterkeyn, 2010; Rosenfeld, 2008; Waterkeyn, Matimati, & Muringaniza, 2009; Waterkeyn, Okot, & Kwame, 2005; Waterkeyn & Rosenfeld, 2009). Four sources were doctoral or masters theses (Munyoro, 2016; Ncube, 2013; Rwagitare, 2016; Waterkeyn, 2006), three were advocacy papers (Beesley & Feeny, 2016b, 2016c; Beesley, Feeny, Thomas, & Mathiabu, 2016), and two were working papers or program reports (Azurduy et al., 2007; Rosenfeld & Taylor, 2015). The 19 sources reported on outcomes in six categories: (1) WASH behavior, (2) WASH knowledge, (3) WASH collective action, (4) health, (5) social, and (6) cost-effectiveness.

Behavior

Fifteen (15) of the nineteen studies in this review reported behavioral outcomes. Thirteen (13) of these studies reported quantitative results, while two (2) provided qualitative or anecdotal evidence. In general, the papers reported behavioral outcomes focused on five behavioral dimensions: sanitation, drinking water, hand washing, environmental management, and kitchen hygiene. In the first study of CHCs in Zimbabwe, Dr. Waterkeyn measured differences between intervention and control households on 20 observable WASH behaviors in two districts (Waterkeyn, 2006; Waterkeyn & Cairncross, 2005). In one district, there was a significant difference between CHC and control households on 16 WASH behaviors, and in the second district, there was a significant difference on nine WASH behaviors. CHC members in both districts were significantly more likely to use individual cups and plates, not practice open defecation, construct a new latrine, have a hand washing facility with soap, and construct a pot rack and rubbish pit.

Two additional studies provide quantitative data about the impact of CHCs on WASH behavior in Zimbabwe. Ncube (2013) reported a 30-40% increase in observably clean yards, toilets and water taps. The study also reported that 92% of CHC members could demonstrate correct hand washing behavior (pouring water over their hands rather than a shared, common bowl) compared to 35% of control respondents. Whaley and Webster's (2011) study compared short term and sustained outcomes of a CHC intervention to a CLTS intervention. In terms of short-term outcomes, the study reported a significantly greater reduction in open defecation and use of handwashing facilities in CHC compared to CLTS communities. Conversely, households in the CLTS communities were more likely to have a latrine and to share that latrine with their neighbors than CHCs. In terms of long-term outcomes, there was no difference in sustained behavioral changes for households in CHC and CLTS communities; however, the study found that CHC households were more likely to have sustained the use of a hand washing facility (37% versus 2%).

Outside of Zimbabwe, there is also evidence of WASH behavioral changes from South Africa, Rwanda, Uganda and Haiti. In two studies from South Africa, change across a range of behaviors was also observed. Waterkeyn & Rosenfeld (2009) measured a 36% average change on 12 observable WASH indicators in rural South Africa. In urban South Africa, Maksimoski & Waterkeyn (2010) created a summative behavioral score for 10 observable behaviors, which the authors categorized as low, medium and high. At baseline, 58.4% of all respondents were categorized as medium. At mid-point, 79.2% of CHC households were categorized as high compared to 36.9% of non-CHC households. Further, households reporting that they did not openly defecate increased by 75.6% (Maksimoski & Waterkeyn, 2010). In Uganda, CHC members achieved 159% and 146% coverage of pot racks in two Internally Displaced Camps after three months, and after six months almost 12,000 latrines had been constructed by CHC members without support or subsidy (Waterkeyn et al., 2009, 2005). A randomized controlled trial was conducted in Rwanda comparing the 'classic' CHC program (full-length curriculum) to a 'lite' version (shortened-duration curriculum) and control communities. The study found that participants in the classic arm were significantly more likely to utilize household water treatment practices and to have a structurally complete, improved sanitation facility (Sinharoy et al., 2017). In a related study from Rwanda, households in the classic CHC arm demonstrated greater adoption of improved hygiene behaviors after the intervention, including maintenance of a clean latrine (14.4% vs 2.4%), construction of a hand washing facility (41% vs 5.1%), safe drinking water storage (15.6% vs 3.7%), and use of a mosquito net (28.6% vs 10.6%). Finally, from Haiti, CHC members were more likely

to practice improved drinking water storage, defecation, hand washing and environmental management practices than non-members from the same community. Further, non-members were 7.1 times more likely to report open defecation than members, while members with latrines were significantly more likely to have a clean and sealed sanitation facility (Brooks et al., 2015).

Two papers provided qualitative and anecdotal evidence of the impact of the CHC intervention on WASH behaviors and practices. In Sierra Leone, the authors used program documents and observations to report that members had constructed clotheslines and pot racks, began drinking water from safe sources, and that members had cleaner environments than before the intervention (Azurduy et al., 2007). In the Democratic Republic of Congo, the authors of three advocacy papers reported that CHC members had stopped practicing open defecation, had begun using improved hand washing practices, and had begun constructing latrines, pot racks and rubbish pits (Beesley & Feeny, 2016b, 2016c; Beesley et al., 2016).

Knowledge

The second most common outcome reported in the literature was WASH knowledge. Of the seven (7) studies that measured WASH knowledge, the majority measured respondent's knowledge about the transmission or prevention of common WASH diseases (e.g., diarrhea, skin diseases, intestinal parasites, and malaria) and recommended WASH behaviors (e.g., hand washing, drinking water storage, composition of a home-made oral rehydration solution). One study measured respondent's knowledge about the symptoms of common WASH diseases. Five (5) of the seven studies measured respondent knowledge quantitatively, while two provided qualitative or anecdotal evidence. Only one study explored the relationship between WASH knowledge and behaviors.

The five studies that measured WASH knowledge quantitatively reported summative scores, where respondent's knowledge was categorized from low to high. For each score, respondents were asked a series of WASH knowledge questions (ranging from four to nine questions), and the number of correct responses for each question were recorded. The authors then totaled the correct responses and categorized the score as low, medium or high knowledge. In the first cohort of Zimbabwean CHCs, Waterkeyn (2006) found that CHC respondents provided a significantly higher number of correct responses on a series of nine questions than non-CHC respondents and that 63% of all CHC respondents had good knowledge compared to 35% of controls. Building upon this data set,

Waterkeyn and Waterkeyn (2013) explored the relationship between respondent's level of knowledge and WASH behaviors. The authors found that 80% of CHC respondents with 'full knowledge' (correct responses on all nine knowledge questions) practiced 10 recommended behaviors, compared to 17% with 'some knowledge' and 6% with 'no knowledge. Further, half of non-CHC respondents with 'full knowledge' practiced the 10 recommended behaviors.

In a study from Zimbabwe, 65% of CHC respondents had 'good' WASH knowledge; in contrast, 65% of non-CHC respondents had 'poor' WASH knowledge (Ncube, 2013). In the Dominican Republic, CHC respondent's scores on a five item composite knowledge index (scores ranging from 0-23 points) increased significantly from 5.82 at baseline to 8.41 post intervention, and CHC respondent post intervention scores were significantly higher than non-CHC respondent post intervention scores (8.41 versus 6.56) (Rosenfeld & Taylor, 2015). Further, a study from Haiti found that CHC graduates were significantly more likely to have high knowledge scores (71.2%) compared to non-CHC respondents (4.1%) at the conclusion of the WASH curriculum (Brooks et al., 2015). This study from Haiti also found that education and age influenced the average knowledge scores for non-CHC respondents, whereas the mean knowledge scores for CHC graduates were consistently higher, regardless of education and age.

Two studies reported an impact of the CHC intervention on knowledge using qualitative data and anecdotal evidence. Munyoro (2016) provided quotes from intervention participants who described how the intervention increased their knowledge and understanding about WASH diseases such as diarrhea, and the importance of personal hygiene, hand washing and safe drinking water practices. Finally, a program report authored by Azurduy et al (2007) discussed that CHC members were able to list all of the topics that they learned.

Collective Action

Another commonly reported outcome was increased WASH collective action amongst CHC members. Five papers provided qualitative and anecdotal evidence of CHC members engaging in some form of collective action. Three papers described collective action around environmental management. In Zimbabwe, Munyoro (2016) reported that the sampled CHCs initiated community-wide garbage clean-up campaigns, while Ncube (2013) documented that CHCs engaged in 17 community-cleanliness campaigns. Similarly in Haiti, the most commonly reported CHC activity for WASH collective action was communal clean-up campaigns (Brooks et al., 2015). In

addition to these campaigns, two papers reported that CHC members worked together to improve communal water points. Rosenfeld (2008) reported that the CHCs in South Africa worked together, without external subsidy or technical support, to improve communal water points incrementally; including improvements to spring water catchment and the creation of a simple gravity fed piped water system. Finally, CHCs in the Democratic Republic of Congo, with the technical support of an external NGO, worked together to construct more accessible safe water points in their villages (Beesley & Feeny, 2016b, 2016c; Beesley et al., 2016).

Health

Five papers reported an impact on health outcomes, only one of which provided verifiable, empirical evidence. In the Rwandan randomized control trial, the researchers found that there was no difference between the three study arms in health (diarrhea) and anthropomorphic outcomes (height for age, length for age, and weight for height) in children under one, two and five years (Sinharoy et al., 2017). Conversely, but anecdotally, three advocacy papers described a CHC program in the Democratic Republic of Congo using CHC member reports and stories, which suggested an overall improvement in health for everyone, as well as a reduction in preventable diseases such as diarrhea and intestinal parasites (Beesley & Feeny, 2016b, 2016c; Beesley et al., 2016). Similarly, Azurduy et al (2007) anecdotally reported that there was a general reduction in maternal and child mortality as a result of the CHC intervention.

Social

Six (6) papers reported enhanced social cohesion and unity, but none quantitatively measured these social outcomes. In a PhD thesis, Waterkeyn (2006) described how the CHCs created social capital, as evidenced by qualitative data that described how CHC members reported a greater likelihood to support each other, especially those who were sick or facing financial challenges. Waterkeyn also documented improved social bonds and noted that CHC members anecdotally reported an increase in social standing and respect from family, friends and neighbors due to their participation in the intervention (Waterkeyn, 2006; Waterkeyn & Cairncross, 2005). In two later papers describing CHCs in Zimbabwe, the authors reported similar enhancements to social bonding. Ncube (2013) described how enhanced community cohesion and understanding brought families and neighbors together in urban environments that were usually characterized by individualism. Whaley & Webster (2011) described that the CHCs created a dynamic in which social bonds were formed and strengthened and resulted in increased likelihood

that CHC members would work together and help each other. Similar results have been reported outside of Zimbabwe. In post-conflict Sierra Leone, Azurduy et al (2007) describe how CHCs created communal unity and a collective spirit, which resulted in an increase in decision-making by women and the formation of additional communal groups focused on income generation and social support. In Haiti, Brooks et al. (2015) reported an increase in social bonding through the CHCs, which facilitated behavioral changes and led to collective action.

Cost

Finally, two papers attempted to describe the cost or cost-effectiveness of a CHC program. In Waterkeyn's thesis (2006), the author used program data to report the intervention achieved impact on WASH knowledge and behaviors (reported above) at a cost of $0.35 per beneficiary, or an average of $4 per household per year. In Rwanda, the authors had program coordinators and supervisors qualitatively rate the cost-effectiveness of the classic and lite arms of the intervention. After study participants reviewed the overall costs of implementing the classic and lite arms, they then reflected upon their knowledge of the impact each arm had on knowledge, behaviors and health outcomes. The majority of key informants described the classic arm as qualitatively more cost-effective than the lite version.

Synthesis

This review found evidence, although of variable quality, that the CHC model has an impact on WASH and social outcomes. The most commonly reported and consistent evidence focused on WASH knowledge and behaviors. Although the authors of the only experimental study reported limited behavioral impacts, all quasi-experimental and qualitative designs reported significant changes in WASH knowledge and behavior in CHC households. Compared to knowledge and behavior, there is minimal evidence of the intervention's impact on health and social outcomes. Only one study rigorously evaluated health outcomes and found no evidence that the intervention reduced the incidence of diarrhea in children under five years of age. All other information about health outcomes was anecdotal or qualitative. Similarly, all information identified through this review about the impact of CHCs on collective action, social capital and other social outcomes was anecdotal or qualitative. There is clearly a need for additional research into the health and social impacts of the CHC intervention.

Overall, the quality of the research and manuscripts reported in this review was moderate. Only one experimental study design was used to evaluate the impact of the CHC intervention. The program evaluations

reported by Waterkeyn (2006), Waterkeyn & Cairncross (2005), Brooks (2015), Ndayambaje (2016), and Whaley & Webster (2011) utilized rigorous quasi-experimental and case study designs. Other papers utilized program-monitoring data with no controls. The quantitative studies published by Munyoro (2016) and Ncube (2013) utilized less rigorous designs and reported data that was generally of lower quality (e.g.; poorly designed and executed measures or no comparisons). The remainder of the papers or reports provided qualitative or anecdotal evidence. This review highlights the need for additional research into the impact of CHCs, using more rigorous study designs that can empirically describe the impact of the intervention.

CHAPTER 3: METHODS

Conceptual Model

Figure 1: Conceptual model describing the relationship between social capital and WASH knowledge, attitudes, and practices and WASH collective action in the CHC model.

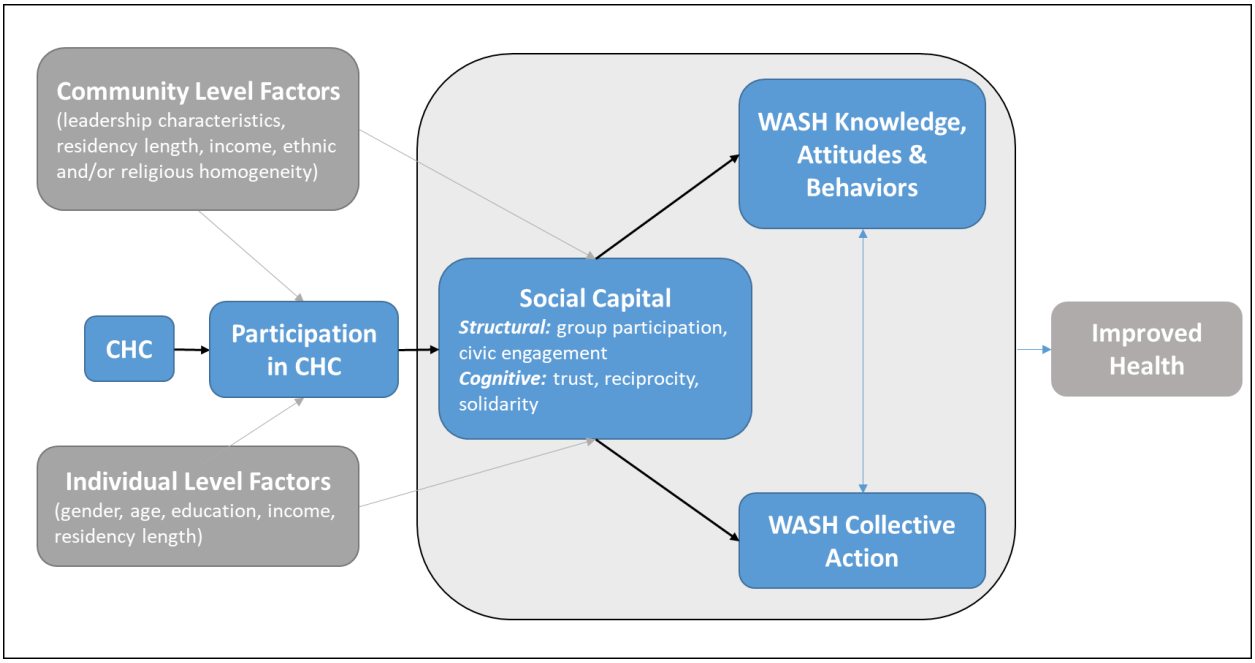


Figure 1 presents the conceptual model that guided this research, which is an adaptation and integration of two frameworks proposed in the literature. The first, proposed by Bisung and Elliot (2014), describes the mediating role that social capital plays in the 'water-health' nexus. In this framework, individual and communal social capital leads to improved health outcomes in WASH programs through two pathways. Social capital may serve to enhance WASH behavioral interventions through expansion of social networks that increase trust and social cohesion, which contribute to improvements in WASH knowledge, attitudes and practices. Further, social capital may facilitate collective action to address issues around access, utilization, operation and maintenance of water and sanitation facilities (Bisung & Elliott, 2014). The second framework generally describes the ways in which neighborhood social capital influences individual health outcomes (Richard M. Carpiano, 2006). Carpiano (2006) identifies neighborhood and individual level antecedent factors that can influence social cohesion and communal social

capital, which in turn can lead to improved individual health behaviors and ultimately improved health outcomes. Carpiano identifies social support, social leverage, informal social comparison, and participation in neighborhood organizations as the four main forms of social capital that mediate health outcomes. Additionally, cognitive forms of social capital are labeled as social cohesion and antecedents to social capital.

In our proposed framework, engagement or participation in a CHC intervention is influenced by both individual and community level factors. The individual factors include gender, age, education, income, and residency length. The community factors include communal leadership characteristics, median length of residency, median income, and ethnic composition. Once individuals choose to participate in a CHC program, they begin to generate social capital. Depth of engagement in CHC activities influences individual social capital. This includes participation in collective activities outside of the regular weekly meetings or accepting a leadership role within a CHC. Subsequently, increased social capital facilitates the attainment of improved WASH knowledge, behaviors, and collective action around water, sanitation and other environmental management activities. WASH knowledge, behaviors and collective action are mutually reinforcing and improve individual health outcomes. This framework assumes that both structural and cognitive forms of social capital are important, but we did not generate hypotheses about their relative impact on WASH knowledge, behaviors and collective action prior to initiating this research. Finally, the literature has found that pre-existing levels of social capital are essential to the success of WASH programs (Bisung et al., 2014; Cameron et al., 2015; Isham & Kahkonen, 2002; Isham & Kähkönen, 1999). The argument is that the amount of social capital in a community might influence participation as communities with greater trust, group participation and social cohesion might be more willing to participate. However, we hypothesize that this is not important within the context of the CHC model since the model generates social capital. We do not dismiss the role that social capital plays in program initiation and success, but theorize that it is a combination of social capital, individual demographic, and community level factors that influence participation in CHC interventions. The CHC model's approach to community mobilization and education is appealing and engaging, which is sufficient to overcome low baseline levels of social capital.

Study Methods

The purpose of this study was to describe the relationship between social capital and a WASH CHC program in Haiti. We used an explanatory sequential mixed methods study design. Mixed methods research is an

approach that involves the collection, analysis, and integration of both quantitative and qualitative data (Creswell & Creswell, 2017). The core assumption of mixed methods research is that the combination of quantitative and qualitative methods provides a more complete understanding of a research problem or phenomena than either alone. Mixed methods research is relatively new, originating around the late 1980s and early 1990s from work of individuals in fields as varied as evaluation, education, sociology and health sciences (Creswell & Creswell, 2017).

For the mixed methods design, we first conducted a secondary analysis of quantitative data from a program evaluation that assessed the impact of a CHC intervention in Haiti on WASH knowledge, behavior and social capital. We used this data source to assess whether the CHC intervention stimulated changes in social capital, and WASH knowledge and behaviors, as well as whether social capital mediated changes in WASH knowledge and behavior. We then collected primary data using qualitative focus group discussions to describe and explain the mechanisms or pathways by which the CHC intervention facilitated the observed changes in social capital, and WASH behaviors and collective action, and to explore how social capital mediates changes in WASH behaviors and collective action. Importantly, we utilized the quantitative results to drive the development of our qualitative questions and sampling plan.

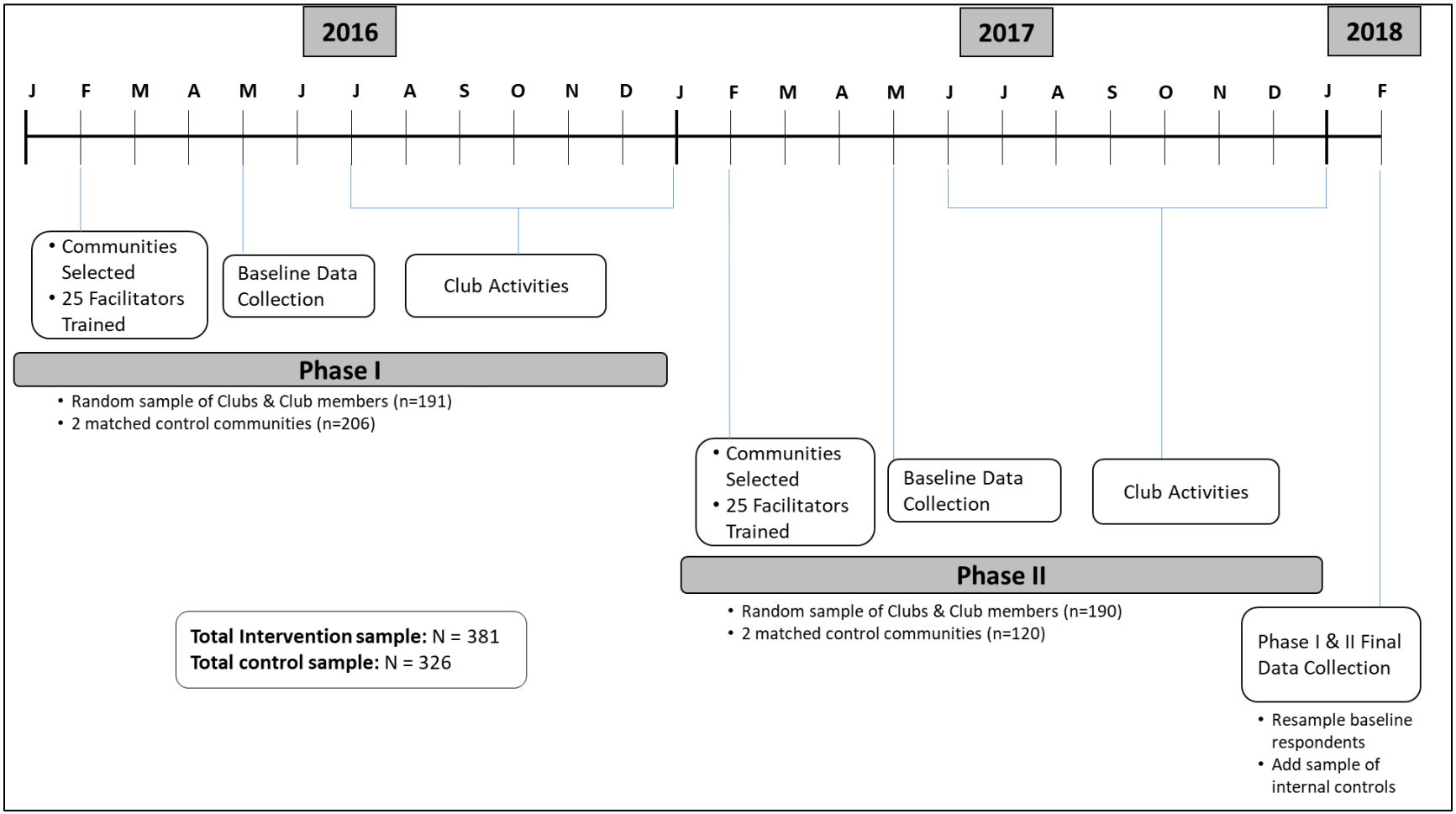
Quantitative Methods: Aims 1 and 2

Secondary Database

Haiti CHC Program

In 2016, the CMHE at UT Health San Antonio along with its partner in Haiti, the Eco-Eau et Jeunesse Haiti (EEJ) organization, initiated a two-year WASH education and behavior change program in Haiti's Central Plateau using CHCs. Under this program, the CMHE and EEJ trained 25 community-based facilitators from the Mirebalais and Lascahobas communes (lowest administrative or territorial division in Haiti, of which there are 145) in February 2016 (Phase I). Under Phase I, the trained facilitators formed 16 CHCs (nine facilitators left the program) and implemented the six-month WASH curriculum with 788 CHC members (average of 49 members per CHC) between June and December 2016. In February 2017, an additional 25 facilitators from the Mirebalais, Lascahobos, Boucan Carré and Belladere communes were trained (Phase II). Under Phase II, 19 CHC's were formed (six facilitators left the program) and the facilitators implemented the WASH curriculum with 819 CHC members (average of 43

Figure 2: CHC program & evaluation design (2016-2017)



members per CHC) from June 2017 to February 2018 (Figure 2). This two year CHC program was implemented in 35 communities across 4 communes.

Program Evaluation Design

Both phases of this program were evaluated using a quasi-experimental study design with a pre- and post-intervention survey in a random sample of intervention and matched comparison communities. Comparison communities were matched by community size and distance from intervention communities. It was not possible to match communities on WASH variables (e.g. drinking water access, sanitation access, defecation practices, hand-washing practices) or social capital variables due to a lack of data. Baseline data were collected in June 2016 for Phase I and June 2017 for Phase II. Post-intervention data for both phases were collected between March and April 2018. See Figure 2 for a description of the program and evaluation timeline. The evaluation protocol was submitted for review by the UT Health San Antonio IRB, which determined this study to be non-regulated research since the purpose was program evaluation (HSC20170570N).

Sampling

The sample size for this evaluation was designed to obtain results that were representative of the population and used a proportional approach to the standard sample size formula. With a confidence interval set at t=1.96 (95% confidence interval) using a reduced centered normal rate, the estimated proportion of the population set to p=0.5 (the proportion of CHC members per community was unknown at baseline) and the margin of error set at e=10%, the minimum sample size per commune was determined to be 96 people. Therefore, a target sample of 100 CHC member households per intervention commune was established per study phase, with a matched respondent/household in two comparison communities (one per commune). CHCs were randomly sampled from each commune, proportional to the distribution of CHCs per commune. Within each CHC, a random sample of registered CHC members was taken, proportional to the total population of that CHC. Four comparison communities, one per commune and two per Phase, were also selected based upon distance from the intervention communities and relative size.

For the intervention communities, EEJ provided the evaluation consultant with a list of names of all registered CHC members for the sampled communities. The consultant randomly sampled individuals from each list using a random number generator in Microsoft Excel. The consultant then visited the CHC facilitator to identify

each of the randomly sampled member's household. If a CHC member or head of household was not at home during the initial visit, the evaluation team returned once, after which that household was dropped from the study. Replacements were not included. For the comparison communities, systematic random sampling techniques were followed, whereby the evaluation team would begin in the southwest corner of a community and visit every *nth* household until the required sample was collected.

In total 707 people were sampled at baseline, including 381 intervention respondents (Phase I = 191; Phase II = 190) and 326 comparison respondents (Phase I = 206; Phase II = 120). All baseline respondents were resampled in March 2018 for the final evaluation. In total, 694 of the 707 respondents sampled at baseline were revisited during final data collection, with 521 respondents agreeing to participate (284 intervention and 237 comparison respondents). Loss to follow-up was 26% (26% for the intervention sample and 27% for the comparison sample), with 10% of respondents having moved or died, 9% refused to participate, 5% were unavailable, and 2% were not located. Appendix 4 provides a complete description of the study sample, disaggregated by intervention status, respondent type, commune and community.

Inclusion & Exclusion Criteria

For the intervention communities, study participants were either 1) male or female CHC members over the age of 18 years (Member), or if the Member was unavailable or under the age of 18 years, 2) male or female heads of household over the age of 18 years where a CHC member resided (Non-Member). In the comparison communities, study participants were male or female heads of household over the age of 18 years.

Data Collection Procedures

Data were collected by a team of six Haitian graduate research assistants (RAs), supervised by a professional evaluation consultant from Port-au-Prince. At baseline, the RAs collected data over two, 2-week periods (May/June 2016 and May/June 2017). RAs collected post-intervention data over a five-week period (March 10 to April 12, 2018). The RAs conducted the surveys in person at each respondent's household as structured interviews and direct observations of key areas of the household (described below). Upon completion of the interview questions, the RAs asked permission to make observations of the household's kitchen, yard, and toilet, and then to wash their hands. The units of analysis for the variables collected with this survey tool were the individual respondent and areas of the household associated with WASH behaviors. Data were collected using a standardized

household survey deployed via android tablets equipped with the Open Data Kit (ODK) research toolkit, an open-source suite of tools for mobile data collection. The evaluation consultant exported all survey data from ODK to Microsoft Excel for data management.

Measures

The survey (Appendix 5) included demographic variables, questions and direct observations measuring WASH knowledge, attitudes, norms and behaviors, and a series of social capital measures. The following is a summary of the major variables we used for the first two aims of this study, and a more detailed description of the WASH knowledge, WASH behaviors and social capital variables follows.

Respondent: categorical variable. Measures whether a respondent was a member of a CHC, a resident of a household were a CHC member resided, or a comparison respondent.

Time: categorical variable. Variable indicating whether data were collected at baseline or final.

WASH Knowledge Score: continuous variable. A measure of a respondent's WASH knowledge, as calculated from the number of correct responses a respondent provides to four basic WASH questions. (Appendix 5)

Hygiene Index Score: continuous variable. A measure of a respondent's preventive WASH behaviors, as calculated from 16 structured observations (Appendix 6).

Group Membership/Participation Score: continuous variable. A dimension of structural social capital computed as a standardized factor score representing each respondent's group membership and participation (Appendix 7).

Social Support Score: continuous variable. A dimension of cognitive social capital computed as a standardized factor score representing each respondent's perceptions about how they and their neighbors support each other (Appendix 7).

Trust Score: continuous variable. A dimension of cognitive social capital computed as a standardized factor score representing each respondent's perceptions of both internal (to the community) and external (outside their community) social trust (Appendix 7).

Social Solidarity Score: continuous variable. A dimension of cognitive social capital computed as a standardized factor score representing each respondent's perceived social solidarity (Appendix 7).

WASH Knowledge

WASH knowledge was measured via four questions. The four questions asked respondents to name (1) ways to prevent the transmission of diarrhea, (2) essential times to wash hands during the day, (3) ways to prevent the transmission of skin diseases, and (4) the three ingredients for a homemade oral rehydration solution. For the first three questions, respondents earned 1 point for each correct response, with a maximum of 7 points for ways to prevent transmission of diarrhea, 10 points for essential times to wash hands, and 6 points for ways to prevent transmission of skin diseases. For the question about the ingredients for a homemade oral rehydration solution, respondents were awarded 1 point for each correct response with a maximum of 3 points. We created a composite WASH knowledge score by summing the four knowledge questions. The maximum score possible was 26 points, with a range of 0-26 points.

WASH Behaviors

WASH behaviors were measured via direct observation and reported as a continuous hygiene index score. The RA's assessed a total of 16 observable indicators that are part of five essential WASH behavioral dimensions: kitchen hygiene, drinking water management, environmental and solid waste management, sanitation and defecation practices, and hand washing practices. Each observable indicator was scored as 0, 0.5, or 1 point (Appendix 6). Fourteen indicators (e.g. presence of observable garbage within five paces of the household, respondent used pour to waste method for hand washing, no flies were present in the kitchen) were coded as 0 (not present) or 1 (present). Two indicators, a clean latrine (free of urine, feces and garbage) and a sealed latrine (squat hole or seat was covered), were coded as 0 (not present) or 0.5 (present). These two indicators were scored together because they represent good defecation practices for respondents with a latrine (1 point); good defecation practice for respondents without a latrine was represented by fecal burial (1 point). Thus, regardless of access to a latrine, every respondent had potential to receive the same maximum score.

We recoded the hygiene index variables as follows. All negative observations (e.g. uncovered food observed in kitchen, no garbage container observed, standing water observed in yard, unclean latrine observed) were reverse coded (i.e., 1's coded to 0). All indicators coded as 'Cannot See' or 'Not Applicable' were recoded as

missing. We then calculated the total number of missing indicators for each respondent. For those who had at least twelve indicators (75% of the 16 possible), we summed the indicators to create a hygiene index. We removed respondents from the analysis if they had greater than 25% missing indicators. The maximum number of points possible on the hygiene index was 14, with a range of 0-14 points.

Social Capital

We adapted the social capital measures from the World Bank Social Capital Assessment Tool (SOCAT) (Grootaert, Narayan, Jones, & Woolcock, 2004; Person et al., 2017). The survey focused on three dimensions that measured both structural and cognitive social capital: group membership, trust & solidarity, and civic engagement & participation. The survey included three items related to group membership, twelve items related to trust and solidarity, and nine items related to civic engagement and participation. The social capital variables were measured via direct interview questions.

We used Categorical Principal Component Analysis (CATPCA) (IBM, 2018; Koutsou, Partalidou, & Ragkos, 2014; Lengen & Blasius, 2007; Meulman, Van der Kooij, & Babinec, 2002) to reduce the 24 social capital items included in the survey into a sub-set of factors or dimensions for regression analysis. Other social capital researchers have recommended the use of composite measures rather than single-item indicators (Harpham, 2008; Lochner, Kawachi, & Kennedy, 1999). PCA is frequently used because it facilitates data simplification and reduction of variability by grouping social capital indicators into new components or factors (Akçomak & Ter Weel, 2009; Hurtado, Kawachi, & Sudarsky, 2011). Further, PCA was appropriate for this study because it was necessary to determine whether the measures adapted from the SOCAT tool were grouping together around the constructs or dimensions of social capital they were intended to measure (Sabatini, 2009). The survey included measures from the trust and social solidarity, and civic engagement and participation sections of the SOCAT tool. Therefore, we used CATPCA to determine whether the data from the survey grouped together in meaningful ways around those same constructs.

In order to conduct the CATPCA, we first recoded the three continuous group membership measures to categorical variables. Second, we recoded the 21 SOCAT measures so responses indicating higher social capital resulted in a higher value (e.g. No Trust = 1, Not Much Trust = 2, A Lot of Trust = 3; My neighbors would help if my house was damaged = 2, My neighbors would not help if my house was damaged = 1). 'Don't Know' and 'No Response' were coded as 'Missing'. We then ran the CATPCA using all 24 social capital items three times,

generating four, five and six factors so we could determine the appropriate number of factors (IBM, 2018). After analyzing the frequencies, distributions and component loadings, we determined that a four-factor solution sufficiently explained the variance and was more interpretable than the five- or six-factor solutions. We also found that the general social capital variables (e.g. general trust, general support, general community trust, general community support, and general community participation) distorted the results and were removed from the final CATPCA analysis. Finally, we reran the CATPCA with the remaining 19 social capital items, using variable principle normalization and promax rotation. The result was four principle factors: group participation, social support, trust, and social solidarity. The analysis also computed standardized scores for each factor for each participant. See Appendix 7 for the results of the CATPCA, including Cronbach alpha, eigenvalues and component loadings for each factor.

Secondary Analysis Methods

We first conducted descriptive analyses of all the independent, dependent and covariate variables included in this study, which included testing the standard assumptions for mixed effects, linear regression modeling. These included tests of normality of the dependent variables, collinearity between the independent variables, normality of regression residuals, and heteroscedasticity. The standard assumptions were met and thereafter, we tested each hypothesis using multi-level, mixed-effect linear regression models. We carried out all analyses and models using both the full study sample (intervention versus comparison) and the sub-sample of respondents from the intervention sample that self-identified as CHC members (CHC members versus comparison). The full sample, as described above, consisted of 381 intervention and 326 comparison respondents at baseline, and 284 intervention and 237 comparison respondents at final. The sub-sample included 181 participants who self-identified as CHC members, and were not lost to follow-up (Appendix 4).

Aim 1 Analysis

Hypothesis 1a

H1a: Intervention participants will have significantly greater increases in social capital, WASH knowledge, and WASH behaviors after a one-year intervention than respondents in comparison communities.

We conducted difference-in-difference analyses using multi-level linear regression models to test whether intervention participants had significantly greater increases in social capital, WASH knowledge, and WASH

behaviors as compared to comparison respondents, after a one-year intervention. We evaluated the average change over time of the six dependent variables for intervention respondents versus comparison respondents: (1) hygiene index; (2) WASH knowledge; (3) group membership/participation; (4) trust, (5) social solidarity, (6) social support. The independent variable (Appendix 5) for this model was CHC Membership. The models accounted for correlation of repeated household measures and clustering of households within communities using a maximum likelihood estimation method and the Satterthwaite method for computing the denominator degrees of freedom. The models included fixed effects for time, treatment/comparison condition, and their interaction, and we evaluated the effect of the CHC by examining the significance of the interaction term. Following a difference-in-difference analysis, a significant interaction term indicated that the change in outcomes over time were different for intervention respondents compared to comparison respondents, under the assumption that differences between groups would have otherwise remained constant over time without intervention. The models also included random intercepts for each community and households nested within each community. Finally, the models included fixed effects covariates of respondent's gender, education, marital status, community, home ownership, and household income. We assessed significance using two tailed tests at $\alpha \leq 0.05$, and marginal significance using two tailed tests at $\alpha \leq 0.10$.

Hypothesis 1b

H1b: Intervention participants will have significant increases in WASH knowledge and behaviors, independent of baseline social capital, after a one-year intervention.

We used multi-level linear regression models to test the hypothesis that baseline social capital scores would not alter the impact of the CHC intervention on WASH knowledge and behaviors after the one-year intervention. The purpose of this analysis was to assess whether baseline social capital measures were significant in association with change in knowledge and behavioral outcomes, for intervention respondents only. We tested each of the four baseline social capital scores: membership/participation, trust, social support, and social solidarity, as independent variables in separate models for their effect on change in WASH knowledge and hygiene index scores. The final WASH knowledge and hygiene index scores were treated as dependent variables and we adjusted for baseline measures. A non-significant coefficient on the baseline social capital measures would indicate that baseline social capital had no influence on the change in knowledge and behaviors after the intervention. The models included random intercepts for each community and household nested within each community. We used a maximum

likelihood estimation method, and the Satterthwaite method for computing the denominator degrees of freedom. The models also included fixed effects covariates of respondent's gender, education, marital status, community, home ownership, and household income. We assessed significance using two tailed tests at $\alpha \leq 0.05$, and marginal significance using two tailed tests at $\alpha \leq 0.10$.

We also evaluated whether there was any interaction between baseline social capital scores and the CHC intervention on changes in WASH knowledge and the hygiene index. The purpose of this analysis was to assess whether social capital without the CHC intervention influenced changes in WASH knowledge and behaviors over time, or an interaction between baseline social capital and the CHC intervention resulted in different changes in WASH knowledge and behaviors over time. To test this hypothesis, both intervention and comparison respondents were included in the models. We used the same methods and models as with the intervention respondents only, with the addition of an interaction term between the intervention arm and the baseline social capital measures. We used multi-level linear regression models to test the hypothesis that baseline social capital scores interact with the CHC intervention to influence changes in WASH knowledge and behaviors after the one-year intervention. A non-significant coefficient on the interaction between the baseline social capital measure and intervention arm would indicate that there was no difference in how baseline social capital influenced changes in knowledge and behaviors between the intervention and comparison groups.

Aim 2 Analysis

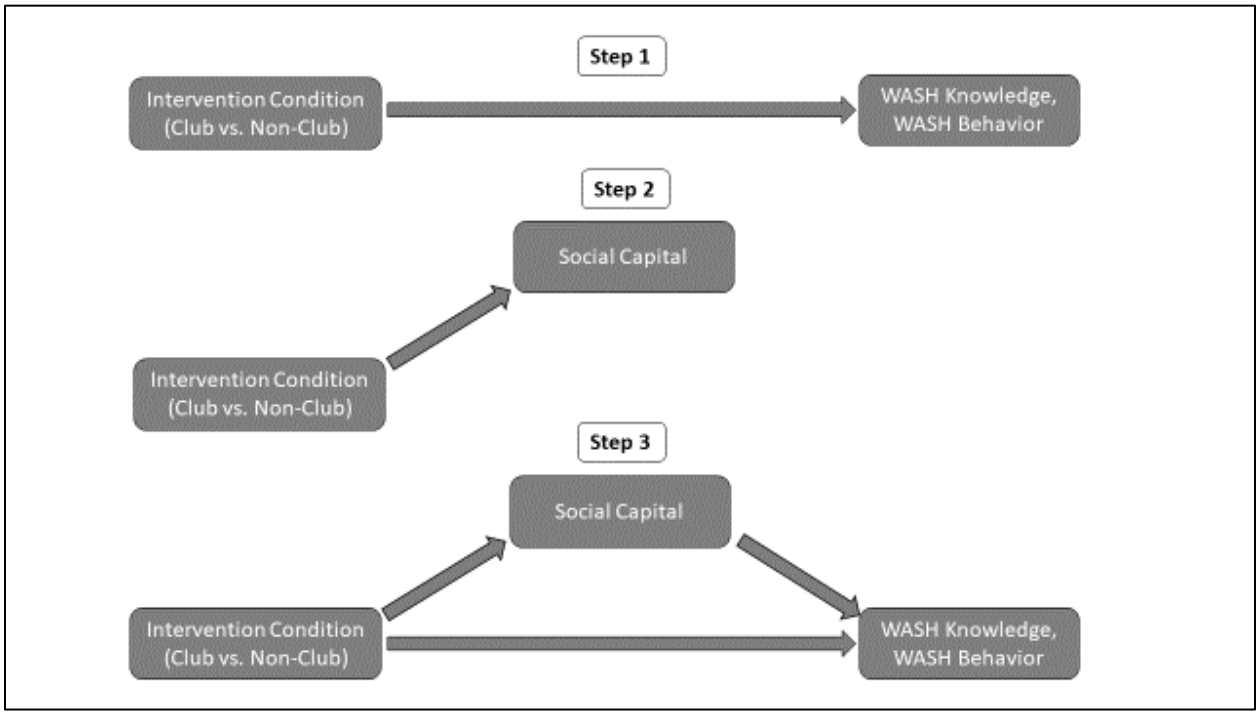
Hypothesis 2

H2: Social capital will partially mediate the effect of the intervention on participant WASH knowledge and behaviors.

We conducted a mediation analysis using multi-level linear regression models to test the hypothesis that social capital would partially mediate the effect of the intervention on participant WASH knowledge and behaviors. As with H1a, the models for the mediation analysis evaluated the average change over time of WASH knowledge and behaviors for intervention respondents compared to comparison respondents. The independent variable for the analysis was respondent type (intervention versus comparison), and the dependent variables were the WASH knowledge scores and hygiene index scores. The mediating variables were the four social capital scores: group membership/participation, trust, social solidary, and social support. The models included random intercepts for each

community and household nested within each community. We used a maximum likelihood estimation method, the Satterthwaite method for computing the denominator degrees of freedom. Fixed effects covariates in these models include respondent's gender, education, marital status, community, home ownership, household size, and household income.

Figure 3: Relationship between variables in mediation analysis



For this analysis, we followed mediation analysis steps from the literature (Baron & Kenny, 1986). First, we assessed the effect of the CHC intervention on changes in WASH knowledge and behaviors (Figure 3, Step 1). If there was no significant relationship, we assumed no mediation was possible given the lack of intervention effect and no further mediation analysis steps were completed. If there was a significant relationship between the intervention and the WASH knowledge and behavior measure, the subsequent steps were followed: we tested the effect of the CHC intervention on changes in social capital (Figure 3, Step 2) and the effect of the CHC intervention (or lack of intervention) on WASH knowledge and behavior when including changes in social capital in the model (Figure 3, Step 3). If social capital mediated the effect of the intervention on change in WASH knowledge and behaviors, then the effect of the intervention on changes in WASH knowledge and behaviors in this model will weaken. To test if mediation effects were significant, we used the Sobel test and calculated the percentage of the

total effect that was mediated and the ratio of the indirect to the direct effect of the models (MacKinnon & Dwyer, 1993).

Data Sharing & Management

A data use agreement between UT Health San Antonio and the University of North Carolina Chapel Hill was created and fully executed on July 11, 2018. Upon receipt of the database from the UT Health San Antonio PI, we stored the original database and all subsequent iterations, on an encrypted and password protected computer. The database was shared as MS Excel file, which we then imported into IBM SPSS Statistics v.25 for cleaning and database preparation, and finally into SAS University Addition, via SAS Studio, to run the regression models.

Qualitative Methods: Aim 3

We used qualitative methods to further explain and contextualize the findings from the quantitative component using both deductive and inductive approaches known as directed content analysis. Directed content analysis is used when the existing theory or prior research that exists to describe a phenomenon is incomplete or would benefit from additional description (Hsieh & Shannon, 2005). This approach uses existing theory or prior research to identify key concepts, themes or variables as initial coding categories as well as possible relationships between codes and themes (Hsieh & Shannon, 2005; Potter & Levine-Donnerstein, 1999). Although analysis begins with a priori themes and codes, directed content analysis allows the researcher to explore additional themes and codes that emerge using grounded theory (Creswell & Creswell, 2017). This approach allows researchers to support or extend existing theory. Directed content analysis was appropriate for this study because we first developed a conceptual framework from existing theory and evidence, which facilitated the creation of a priori themes and codes. However, since we did not know the mechanisms through which WASH interventions created social capital, nor how social capital influences individual and collective WASH knowledge, behaviors, or collective action, we maintained a flexible analysis plan that allowed new themes to emerge during coding.

The goal of this phase of the study was to describe CHC participants' and implementers' perceptions of how social capital influences community engagement in the intervention, as well as on WASH knowledge, behavior and collective action. To achieve this goal, we triangulated data from six focus group discussions. The focus group discussions combined elements of interviewing and participant observation in order to use the group interaction to generate data and insights that would be unlikely to emerge without group interaction (Gilchrist & Williams, 1999).

Research Assistant Training and Pre-Testing Procedures

We trained three Haitian researcher assistants to conduct the six focus group discussions. The lead research assistant was a Haitian-American fluent in English, French and Haitian Kreyol, with over 10 years of experience as a translator and field research. The lead research assistant was responsible for coordinating the logistics for each day of pre-testing and data collection, facilitating the focus group discussions, and transcribing and translating the audio recordings. We also trained two medical residents with prior research experience from the Mirebalais University Hospital (HUM) as discussion coordinators. The discussion coordinators were responsible for collecting consent forms and basic demographic information, operating the audio recorders, leading small group discussions, and taking detailed notes during each discussion.

We spent three days training the research team. On the first day of training, we provided an overview of the study protocol and methods. This included a theoretical discussion of the differences between quantitative and qualitative research, a discussion of the specific methods utilized in this study, and a detailed discussion of the research questions and study aims. We concluded this first day with a general discussion about social capital, and by providing an overview of the study guides and how the questions in the guides related to the qualitative research question and specific aim.

On day two, we covered study roles, responsibilities, and discussion logistics. We also led the team through a line-by-line review of the study guide to clarify any issues with translation. Finally, we concluded the day with a pre-test of the facilitator discussion guide with a sample of CHC facilitators who lived in or near the town of Mirebalais, but were not sampled to participate in the study. The participants received bottled water and a $10 incentive for transportation. We debriefed after the pre-test and updated the discussion procedures. Finally, on day three of the training, the team reviewed the new procedures and conducted a second pre-test with a sample of CHC members. The participants received bottled water and a hygiene kit. After debriefing with team, we updated the probes for the social capital questions, and the discussion guides and protocols were finalized.

Sampling Procedures

We conducted focus group discussions with both program participants and implementers. We conducted these discussions with implementers first so the findings from early discussions informed the content and direction of subsequent discussions (Figure 4). Specifically, we began with the program managers and coordinators, and used

the themes and lessons learned from these stakeholders to frame the discussions with the CHC facilitators and participants (CHC members).

Figure 4: Sequential qualitative data collection process

We used a key informant strategy to identify CHC implementers to participate in the focus groups: one with the CHC facilitators and one with the CHC program managers and field coordinators. The first focus group discussion consisted of EEJ's two program managers, responsible for program training and oversight, and five program coordinators, responsible for CHC facilitator supervision and program monitoring. After discussing the study methods and goals with the program managers, the managers notified the coordinators and jointly identified a day where everyone could meet. Thereafter, the lead research assistant invited the program managers and coordinators to participate in the study on the pre-determined day. The second focus group discussion consisted of four CHC facilitators who formed a CHC, facilitated the six-month WASH curriculum, and graduated at least one member. The program coordinators first contacted the sampled facilitators to make them aware of the study and inform them that the lead research assistant would follow up to schedule a day and time for the discussion. The lead research assistant called each facilitator, identified a day and time, and then invited them to join the discussion on the agreed upon date and time. We held both the manager/coordinator and facilitator discussions at the Hôpital Universitaire de Mirebalais (HUM) in a private conference room. We gave the participants from these two discussions bottled water and 70 Haitian Gourdes ($10 USD) to cover transportation expenses.

For the CHC participant focus groups, we used the results from the quantitative phase of this study to drive the sampling methods. Since the goal of this component of the study was to describe and understand the mechanisms by which the CHC intervention influenced the outcomes of interest, we only sampled intervention communities. In order to gain a diversity of experiences, opinions and perspectives, we sampled communities with high and low degrees of change in WASH knowledge and hygiene index scores from pre- to post-intervention, stratified by communities with high and low social capital factor scores at post-intervention. We also aimed to have at least one

community from each of the four communes where the CHC intervention was implemented (Mirebalais had two communities because proportionally, there were more CHCs in this commune). To make this determination, we first calculated the average difference in WASH knowledge and hygiene index scores from pre- to post-intervention and ranked the top six communities with consistently high or low change (Appendix 8). We then reviewed the post-intervention social capital factor scores for the three communities with the highest change and four communities with the lowest change for both WASH knowledge and hygiene index scores. Finally, we sampled two CHCs with high average changes in WASH knowledge and behaviors (one high and one low average social capital factor scores at post-intervention) and two CHCs with low average changes (one high and one low average social capital factor scores at post-intervention) in WASH knowledge and hygiene index scores (Table 6).

Table 6: CHC sampling strategy for facilitator and member discussions

	Low Post-Intervention Social Capital Factor Scores	**High Post-Intervention Social Capital Factor Scores**
High WASH Knowledge & Hygiene Index Change	n=1	n=1
Low WASH Knowledge & Hygiene Index Change	n=1	n=1

The CHC facilitators from the sampled communities selected the discussion participants and identified a convenient day, time and venue for the discussion. We provided the CHC facilitators with the following criteria to select participants for the groups: all participants had to have received a graduation certificate indicating completion of the entire WASH curriculum, two-thirds of participants should be women, and include a mixture of young and old individuals. CHC member discussions were held in the following locations within each sampled community: Belanger – under a tree outside a primary school; Juampas – in the courtyard of the Club facilitator's house; Dufayi – in the courtyard of a community leader's house; Gilbert – in the carport of the Club facilitator's house. As an incentive, we gave participants a hygiene kit consisting of a plastic bucket, plastic ladle, hand/body soap, laundry soap, chlorine/Clorox, toilet paper, a toothbrush, and toothpaste that was worth approximately $10 each.

Principle Themes & Discussion Procedures

We created separate discussion guides for the managers/supervisors, facilitators and CHC members, each based on the conceptual framework (Figure 1) for this study (Appendices 9, 10, and 11). Questions explored the pathways by which individual and community social capital influenced WASH knowledge, behaviors, and collective

action. Although we explored the relationships between the CHC intervention, social capital, WASH knowledge and WASH behavior quantitatively, the purpose of this component of the study was to contextualize those findings. The discussions also aimed to describe the relationship between social capital and WASH collective action, which was not addressed by our quantitative methods. In each discussion, we explored the following major themes:

- Descriptions and perceptions of the CHC intervention
- Descriptions of individual and communal social capital, specifically trust (generalized and specific), civic participation, social support, norms of reciprocity and collective action
- Perceptions of the CHC intervention's impact on WASH knowledge, WASH behaviors, WASH collective action, and social capital
- Thoughts and perceptions of how social capital influenced diffusion and adoption of WASH behaviors, and achievement of WASH collective action.

We designed the focus group discussion guides to uncover participant's perceptions and attitudes about the CHC intervention. Specifically, we explored their understanding of how the CHC influenced individual and community level social capital as well as the diffusion of WASH knowledge and adoption of WASH behaviors within their CHC and community. We also explored the ways in which WASH behaviors and collective action changed over time, and the factors that influenced that change. For this reason, we utilized behavior over time graphs, an participatory system dynamics diagramming approach designed to elicit discussion and capture stakeholder perceptions of how outcomes of interest change over time and the factors that influence perceived trends (Hassmiller Lich, Minyard, Niles, Dave, & Gillen, 2014; Hoehner, Sabounchi, Brennan, Hovmand, & Kemner, 2015). Participatory system dynamics is an approach to systems thinking that uses qualitative mapping techniques to frame, understand and discuss complex issues and problems (Richardson, 1994, 2011). Specifically, participatory system dynamics can be used to uncover and describe factors or events that influence behaviors within a system. The purpose of behavior over time graphs is to create a picture of how stakeholders perceive a variable changes over a designated period of time (Hoehner et al., 2015). Respondents are guided to draw trend lines on a simple graph, where time (any defined period) is plotted on the horizontal, or x-axis, and the behavior or trend that changes over time is plotted on the vertical, or y-axis. After plotting a specific trend over time, a trained facilitator asks probing questions to help participants uncover and describe relevant factors that influenced changes in the target behavior. We used behavior over time graphs to elicit information from the participants about the factors or events that

influenced (or did not influence) perceived changes in WASH behaviors and collective action, throughout implementation of the WASH curriculum.

Originally, we planned to have all participants create their own behavior over time graphs for two key WASH behaviors and for WASH collective action (three graphs per participants). However, after pre-testing the discussion guides with a group of facilitators and CHC members, it became clear that the methodology was conceptually difficult for some participants, while others were hesitant to create their own graphs. Therefore, we decided that the participants in the CHC member and facilitator discussions would work in small groups (2-4 people each) to co-create behavior over time graphs, while the program managers and coordinators would create individual graphs.

The final protocol for the discussion guides and behavior over time graphs involved introductions and a brief overview of the study. Next, the participants were asked a series of introductory questions about the CHC intervention, their definitions and perceptions of trust, social support and collective action, and the impact the CHC intervention had on WASH knowledge, behaviors and collective action. Thereafter, the discussion facilitator described the behavior over time graphs and, with the help of one discussion coordinator, drew an example line on flip chart paper (on an un-related topic) with the help of the entire discussion group. For the example, participants were asked to describe the availability of mangos throughout the year. While the discussion facilitator asked the participants to consider how many mangos were available each month from January to December, the discussion coordinator created the points and drew the line. Then, while the discussion coordinator annotated the line, the discussion facilitator asked the participants to give reasons why the line increased, decreased or stayed the same.

Upon completion of this example, and a brief question and answer period about the behavior over time graphs, the discussion facilitator asked the participants to consider the changes in three behaviors: hand washing with soap, defecation practices, and collective action. Participants were asked to consider the events, factors or issues that contributed to increases or decreases in each behavior, including specific probes related to the impact of social capital. The participants considered each topic separately, and the manager and coordinator participants worked independently, while the CHC facilitators and members worked in small groups (two people for the facilitators and four people for the CHC members). For the small groups, the discussion facilitator and coordinators were responsible for one small group each, where they facilitated a discussion and helped each small group create

each behavior over time graph. All of the small group discussions were recorded using smartphone audio recorders. The discussion facilitator then reconvened the larger group, where each small group presented their line and described the influencing factors. The discussion facilitator then asked additional probing questions and encouraged engagement from the other groups. Upon completion of the discussion for each behavior, the discussion facilitator introduced the next behavior until lines and discussions were completed for each of the three topics. We completed this process for all but one of the discussions. During the CHC member discussion in Dufyai, the last behavior over time graph was not completed because the discussion was held outside and a heavy rainstorm forced an early conclusion to the discussion.

Analysis

We completed the six discussions over a five-day period in mid-October 2018. Each discussion was conduct in Haitian Kreyol, lasted between 1.25 and 1.5 hours, and was recorded using smart phone audio recorders. Upon completion of a discussion, each member of the research team independently reflected upon the discussion, reviewed their notes, took additional notes, and updated a thematic matrix to capture the major themes that emerged from each discussion (Appendix 12). We then facilitated a group reflection to identify and discuss major themes. In addition to taking detailed notes during these debriefing sessions, each member of the team shared the themes they identified from the discussion, and we facilitated a discussion about thematic discrepancies and similarities. At the conclusion of the data collection procedures, the research team met for one half day to debrief and review all of the major themes that emerged. The output from this final meeting was the preliminary codebook that included *a priori* codes from our conceptual framework as well as new themes that emerged during the focus group discussions.

The lead research assistant created transcripts from the recorded discussions. The research assistant first created the transcripts in Haitian Kreyol and then translated each into English. All transcripts and translations included the small group discussions where behavior over time graphs were created during the facilitator and CHC member discussions. The research assistant completed the transcripts and translations between November 2018 and January 2019. We only reviewed and coded the English transcripts. Transcripts were not back-translated into Kreyol due to a lack of time and resources.

The following steps and procedures guided our qualitative coding. We first uploaded the six English transcripts and the initial codebook into to MaxQDA 2018, a mixed methods research tool we used to manage our

data and facilitate analysis. We used both inductive and deductive methods during our analysis. Two independent coders were used to increase the internal validity and reliability of our coding. One coder led development of a codebook by reading each transcript and taking notes on the common themes and concepts that emerged. The coder re-read each transcript and applied the codes from the initial codebook, which included all of the *a prior* themes from our conceptual framework. This first round of coding helped refine the code definitions and identify representative quotes for each code. Next, the second coder first reviewed and coded the transcript from the manager and coordinator discussion using the preliminary codebook in MaxQDA. Once coded, we assessed inter-coder reliability and identified all of the major inconsistencies and areas of confusion. The two coders then met to discuss these areas and develop consensus about code definitions and applications. During this first meeting, we also added new codes to the codebook. Thereafter, the member and coordinator transcript was coded again, using the new codebook and code definitions. After determining that our use of the codebook was aligned, we then proceeded to code the transcript from a CHC member focus group. Subsequently, the two independent coders met again to discuss the few discrepancies that arose between transcripts. During this meeting, we further refined our definitions and the lead coder (without the second coder) proceeded to re-read and recode the remaining four transcripts using the final codebook. The final codebook is provided in Appendix 13.

The following steps and procedures guided our qualitative analysis. We first determined the frequency by which each code was used across all the transcripts, and then for the transcripts from the CHC member discussions only. Next, we identified the frequency of code application per transcript to explore the distribution of all the codes across all the transcripts and then for the CHC member transcripts only. We also explored the distribution of the social capital codes across all transcripts and the CHC member transcripts only. These steps helped us identify the common themes and their distribution across the transcripts. We then identified the co-occurrences of codes (we explored areas of text where codes overlapped and intersected) and pulled relevant quotes. This part of our analysis was guided by our conceptual framework, and the new themes (and relationships between codes) that emerged during coding.

Institutional Review Board

We submitted IRB protocols to the University of North Carolina and the Zanmi Lasante (ZL)/University Hospital Mirebalais (HUM) Institutional Review Boards. HUM and the ZLIRB approved my study protocol on October 5, 2018 (ID#124) and the UNC IRB approved the study protocol on October 9, 2018 (ID#17-2593).

CHAPTER 4: RESULTS

Quantitative Results

Study Demographics

We present study respondent demographic measures from baseline and final in Tables 7 and 8. Over two-thirds of respondents in both the intervention and comparison samples were women, and approximately one-third of respondents in both samples had completed primary school. Among respondents from intervention communities, a slightly higher proportion of self-identified CHC member respondents were female as compared to non-member respondents at both baseline and final (71.8% vs 65.7% and 72.4% v 64.7%). The average age of respondents in the comparison sample was slightly older at both baseline (39.1 v 37.0) and final (42.3 v 38.8) than the intervention sample. Respondents in the intervention sample reported having lived in their household for an average of two more years than the comparison sample. The average household size was the same for both samples at both periods.

There was little difference in educational attainment between the intervention and comparison sample. However, a higher proportion of CHC member respondents had completed upper secondary school at baseline (24.9% v 17.6%) and final (21.5% v 15.7%) compared to non-member respondents within intervention communities. For the full study sample, the majority of respondents reported that they were either single or living with a partner in a civil-union. However, the intervention sample had a higher proportion of single respondents at both baseline (32.9% v 19.7%) and final (37.5% v 14.8%) than the comparison sample. Further, within the intervention sample, the largest proportion of CHC member respondents were single at both baseline and final (39.2% and 43.6%), while the largest proportion of non-member respondents lived in a civil union (41.2%) at baseline and were married (35.3%) at final. Regardless of intervention status or respondent type, the majority of respondents in the study sample owned their home and did not know their household's monthly income. Of those that did know their monthly income, the majority reported earning no more than 5,000 gourdes per month (less than or equal to $USD64/month or $2/day).

Table 7: Baseline and final study demographics by respondent type and intervention status – categorical variables

		Baseline				Final			
		Intervention Community			Comparison	Intervention Community			Comparison
		Member N=181 n (%)	Non-Member N=102 n (%)	Total N=283 n (%)	N=325 n (%)	Member N=181 n (%)	Non-Member N=102 n (%)	Total N=283 n (%)	N=237 n (%)
Gender	**Female**	130 (71.8)	67 (65.7)	197 (69.6)	228 (70.2)	131 (72.4)	66 (64.7)	197 (69.6)	164 (69.2)
	Male	51 (28.2)	35 (34.3)	86 (30.4)	97 (29.8)	50 (27.6)	36 (35.3)	86 (30.4)	73 (30.8)
Education	**Illiterate**	36 (19.9)	27 (26.5)	63 (22.3)	98 (30.2)	43 (23.8)	27 (26.5)	70 (24.7)	79 (33.3)
	Primary	51 (28.2)	37 (36.3)	88 (31.1)	109 (33.5)	46 (25.4)	37 (36.3)	83 (29.3)	81 (34.2)
	Lower Secondary	33 (18.2)	13 (12.7)	46 (16.3)	36 (11.1)	29 (16.0)	17 (16.7)	46 (16.3)	26 (11.0)
	Upper Secondary	45 (24.9)	18 (17.6)	63 (22.3)	61 (18.8)	39 (21.5)	16 (15.7)	55 (19.4)	38 (16.0)
	Secondary	8 (4.4)	4 (3.9)	12 (4.2)	9 (2.8)	18 (9.9)	4 (3.9)	22 (7.8)	10 (4.2)
	Faculty	5 (2.8)	1 (1.0)	6 (2.1)	5 (1.5)	6 (3.3)	1 (1.0)	7 (2.5)	3 (1.3)
	Don't Know/No Response	3 (1.7)	2 (2.0)	5 (1.8)	7 (2.1)	-	-	-	-
Marital Status	**Single**	71 (39.2)	22 (21.6)	93 (32.9)	64 (19.7)	79 (43.6)	27 (26.5)	106 (37.5)	35 (14.8)
	Married	32 (17.7)	33 (32.4)	65 (23.0)	97 (29.8)	34 (18.8)	36 (35.3)	70 (24.7)	82 (34.6)
	Civil Union	62 (34.3)	42 (41.2)	104 (36.7)	132 (40.6)	56 (30.9)	34 (33.3)	90 (31.8)	97 (40.9)
	Divorced	-	1 (1.0)	1 (0.4)	1 (0.3)	-	-	-	1 (0.4)
	Widowed	14 (7.7)	4 (3.9)	18 (6.4)	30 (9.2)	12 (6.6)	5 (4.9)	17 (6.0)	22 (9.3)
	No Response	2 (1.1)	-	2 (0.7)	1 (0.3)	-	-	-	-
Home Ownership	**Home Owner**	164 (90.6)	89 (87.3)	253 (89.4)	296 (91.1)	163 (90.1)	90 (88.2)	253 (89.4)	219 (92.4)
	Rental	11 (6.1)	8 (7.8)	19 (6.7)	21 (6.5)	12 (6.6)	9 (8.8)	21 (7.4)	15 (6.3)
	Neither Own or Rent	5 (2.8)	5 (4.9)	10 (3.5)	8 (2.5)	6 (3.3)	3 (2.9)	9 (3.2)	3 (1.3)
	No Response	1 (0.6)	-	1 (0.4)	-	-	-	-	-
Monthly Income	**<2,000 HTG***	23 (12.7)	16 (15.7)	39 (13.8)	40 (12.3)	36 (19.9)	19 (18.6)	55 (19.4)	37 (15.6)
	2,000-5,000 HTG	19 (10.5)	19 (18.6)	38 (13.4)	32 (9.8)	21 (11.6)	14 (13.7)	35 (12.4)	34 (14.3)
	5,000-10,000 HTG	11 (6.1)	4 (3.9)	15 (5.3)	11 (3.4)	14 (7.7)	9 (8.8)	23 (8.1)	17 (7.2)
	10,000-15,000 HTG	4 (2.2)	2 (2.0)	6 (2.1)	1 (0.3)	5 (2.8)	3 (2.9)	8 (2.8)	10 (4.2)
	>15,000 HTG	2 (1.1)	1 (1.0)	3 (1.1)	3 (0.9)	-	1 (1.0)	1 (0.4)	5 (2.1)
	Don't Know/No Response	84 (46.4)	40 (39.2)	124 (43.8)	138 (42.5)	71 (39.2)	41 (40.2)	112 (39.6)	96 (40.5)
	Not Applicable	38 (21.0)	20 (19.6)	58 (20.5)	100 (30.8)	34 (18.8)	15 (14.7)	49 (17.3)	38 (16.0)

*HTG = Haitian Gourde. The current exchange rate is $1USD = 84.19 HTG

Table 8: Baseline and final study demographics by respondent type and intervention status - continuous variables

	Baseline				Final			
	Intervention			Comparison	Intervention			Comparison
	Member n=181 (mean, SD)	Non-Member n=102 (mean, SD)	Total n=283 (mean, SD)	n=325 (mean, SD)	Member n=181 (mean, SD)	Non-Member n=102 (mean, SD)	Total n=283 (mean, SD)	n=237 (mean, SD)
Age	36.6 (16.13)	37.9 (14.05)	37.0 (15.4)	39.1 (14.88)	38.5 (16.5)	39.2 (14.43)	38.8 (15.76)	42.3 (15.32)
Years in House	6.74 (9.16)	8.3 (10.95)	7.3 (9.85)	4.96 (8.04)*	16 (13.16)	11.9 (10.83)	14.5 (12.51)	12.82 (12.1)
Household Size	5.53 (2.63)	5.67 (2.56)	5.58 (2.6)	5.5 (2.58)	5.17 (2.53)	5 (2.33)	5.11 (2.46)	5.32 (2.35)

*Sample size: n=323

Hypothesis 1a

The results of the multi-level regression models for the full study sample are reported in Table 9. From baseline to final, both intervention and comparison community respondents demonstrated increases in average WASH knowledge and hygiene index scores and decreases in social capital scores. The increase in average WASH knowledge scores was significantly greater for intervention community respondents. On average, the CHC intervention contributed to a 1.78-point increase (95% CI: 0.94, 2.62) in WASH knowledge scores from baseline to final for all intervention respondents ($p<0.0001$). The CHC intervention did not have a significant effect on the hygiene index and the four social capital scores.

The results of the multi-level linear regression models for the sub-sample of CHC member (from intervention communities) versus comparison community respondents are reported in Table 10. Again, from baseline to final, both CHC member and comparison respondents demonstrated increases in average WASH knowledge and hygiene index scores and decreases in social capital scores. The average increase in WASH knowledge scores for CHC member respondents from baseline to final was significant, and the average score increased by 2.03 points more (95% CI: 1.06, 3.01) than that of respondents in the comparison sample ($p<0.0001$). As with the full intervention sample, the CHC intervention did not have a significant effect on the hygiene index scores for the CHC member respondent sample. However, the regression models for the social capital variables showed a marginally significant *decrease* in trust and social solidarity scores from baseline to final for the CHC member respondent sample. On average, the CHC intervention contributed to a 0.26 (95% CI: -0.53, 0.02) and 0.27 (95% CI: -0.56, 0.02) standard deviation unit decrease from baseline to final in trust and social solidarity scores for CHC member respondents relative to comparison respondents, respectively ($p=0.07$, $p=0.07$).

Hypothesis 1b

The results of the multi-level linear regression models assessing the influence of baseline social capital scores on WASH knowledge and hygiene index scores among intervention community respondents are shown in Table 11. None of the baseline social capital scores had a significant association with change in average WASH knowledge scores. However, baseline social solidarity scores were associated with a significant increase in hygiene index scores from baseline to final. The regression results show that for each standard deviation *increase* above the average social solidarity score at baseline, respondents had a 0.23-point *increase* (95% CI: 0.05, 0.41) on the

Table 9: Average baseline and final scores for dependent variables, mean change from baseline to final for dependent variables, and regression model summaries for H1a (Full Intervention v Comparison)

	CHC Member Household Baseline: n=380 Final: n=283			Comparison Baseline: n=325 Final: n=235			Model Summaries	
	Baseline Mean (SD)	**Final Mean (SD)**	**Mean Change (95% CI)**	**Baseline Mean (SD)**	**Final Mean (SD)**	**Mean Change (95% CI)**	**Treatment Effect (95% CI)**	***p*-value**
WASH Knowledge	5.62 (4.17)	9.16 (4.62)	3.54 (2.95, 4.15)	3.53 (3.6)	5.39 (3.75)	1.72 (1.16, 2.28)	1.78 (0.94, 2.62)	<0.0001*
Hygiene Index†	8.27 (1.56)	8.70 (1.34)	0.46 (0.26, 0.66)	7.88 (1.55)	8.35 (1.67)	0.48 (0.21, 0.74)	0.04 (-0.29, 0.37)	0.80
Participation	0.37 (1.17)	-0.20 (0.91)	-0.58 (-0.74, -0.43)	0.03 (1.04)	-0.39 (0.72)	-0.43 (-0.58, -0.29)	-0.13 (-0.34, 0.09)	0.24
Support	0.28 (0.75)	-0.08 (1.12)	-0.24 (-0.39, -0.09)	-0.09 (0.98)	-0.29 (1.23)	-0.10 (-0.28, 0.08)	-0.13 (-0.35, 0.09)	0.26
Trust	0.10 (1.08)	0.02 (0.92)	-0.03 (-0.16, 0.10)	-0.11 (1.15)	-0.02 (0.90)	0.04 (-0.12, 0.19)	-0.13 (-0.36, 0.1)	0.26
Solidarity	0.11 (0.79)	0.07 (0.98)	-0.03 (-0.17, 0.10)	-0.16 (1.25)	-0.03 (1.07)	0.1 (-0.09, 0.29)	-0.17 (-0.41, 0.06)	0.14

† Sample sizes: Baseline: Intervention n=361, Control n=295; Final: Intervention n=278, Control n=231

*Significant at p=0.05

Table 10: Average baseline and final scores for dependent variables, mean change from baseline to final for dependent variables, and regression model summaries for H1a (CHC Members vs Comparison)

	CHC Members Baseline: n=181 Final: n=181			Comparison Baseline: n=325 Final: n=235			Model Summaries	
	Baseline Mean (SD)	**Final Mean (SD)**	**Mean Change (95% CI)**	**Baseline Mean (SD)**	**Final Mean (SD)**	**Mean Change (95% CI)**	**Treatment Effect (95% CI)**	***p*-value**
WASH Knowledge	6.33 (4.13)	10.26 (4.55)	3.93 (3.16, 4.7)	3.53 (3.6)	5.39 (3.75)	1.72 (1.16, 2.28)	2.03 (1.06, 3.01)	<0.0001*
Hygiene Index†	8.38 (1.46)	9.00 (1.16)	0.67 (0.42, 0.92)	7.88 (1.55)	8.35 (1.67)	0.48 (0.21, 0.74)	0.14 (-0.25, 0.53)	0.48
Participation	0.44 (1.19)	-0.16 (0.93)	-0.60 (-0.8, -0.41)	0.03 (1.04)	-0.39 (0.72)	-0.43 (-0.58, -0.29)	-0.20 (-0.44, 0.05)	0.11
Support	0.31 (0.74)	0.07 (1.05)	-0.13 (-0.31, 0.04)	-0.09 (0.98)	-0.29 (1.23)	-0.10 (-0.28, 0.08)	-0.02 (-0.28, 0.24)	0.87
Trust	0.10 (1.16)	-0.08 (1.00)	-0.12 (-0.3, 0.06)	-0.11 (1.15)	-0.02 (0.90)	0.04 (-0.12, 0.19)	-0.26 (-0.53, 0.02)	0.07**
Solidarity	0.14 (0.73)	-0.002 (1.13)	-0.14 (-0.32, 0.05)	-0.16 (1.25)	-0.03 (1.07)	0.10 (-0.09, 0.29)	-0.27 (-0.56, 0.02)	0.07**

† Sample sizes: Baseline: Intervention n=170, Control n=295; Final: Intervention n=177, Control n=231

*Significant at p=0.05

hygiene index at final (p=0.01). The other baseline social capital scores (participation, support, and trust) were not significantly associated with changes in hygiene index scores at final.

Table 11: Regression model summaries for H1b (Full Intervention v Comparison)

	Effect on WASH Knowledge n=284		**Effect on Hygiene Index n=265**	
	Model Summary		**Model Summary**	
	Estimate (95% CI)	***p*-value**	**Estimate (95% CI)**	***p*-value**
Baseline Participate	0.30 (-0.14, 0.73)	0.18	0.01 (-0.12, 0.14)	0.89
Baseline Support	0.32 (-0.31, 0.95)	0.31	-0.06 (-0.25, 0.14)	0.58
Baseline Trust	-0.21 (-0.66, 0.24)	0.35	0.03 (-0.11, 0.17)	0.65
Baseline Solidarity	0.60 (-0.35, 0.85)	0.29	0.23 (0.05, 0.41)	0.01*

*Significant at p=0.05

The results of the mixed-effects linear regression models assessing the influence of baseline social capital scores on WASH knowledge and hygiene index scores among the sub-sample of CHC member respondents are shown in Table 12. As with the full intervention community sample, none of the baseline social capital scores had a significant association with change in average WASH knowledge scores. However, baseline social solidarity scores were associated with a significant increase in hygiene index scores from baseline to final. The regression results for the sub-sample of CHC member respondents showed a similar 0.25-point *increase* (95% CI: 0.03, 0.46) on hygiene index scores for every one standard deviation *increase* above the average in the social solidarity score at baseline (p=0.03). Again, the other social capital scores (participation, support, and trust) were not significantly associated with changes in hygiene index scores at final.

Table 12: Regression model summaries for H1b (CHC Members v Comparison)

	Effect on WASH Knowledge n=181		**Effect on Hygiene Index n=169**	
	Model Summary		**Model Summary**	
	Estimate (95% CI)	***p*-value**	**Estimate (95% CI)**	***p*-value**
Baseline Participate	0.05 (-0.49, 0.58)	0.87	0.01 (-0.13, 0.15)	0.90
Baseline Support	0.21 (-0.64, 1.05)	0.63	-0.13 (-0.36, 0.10)	0.25
Baseline Trust	-0.14 (-0.65, 0.38)	0.60	0.04 (-0.1, 0.19)	0.54
Baseline Solidarity	-0.56 (-1.37, 0.25)	0.16	0.25 (0.03, 0.46)	0.03*

*Significant at p=0.05

The model summaries for the multi-level linear regression models assessing the impact of the interaction between baseline social capital scores and the CHC intervention on WASH knowledge and hygiene index scores for the full intervention sample are presented in Table 13. There was a marginally significant interaction between the intervention and participation scores on average WASH knowledge scores (p=0.08), and a significant interaction

between the intervention and social solidarity scores on average hygiene index scores (p=0.04). This indicates that the effect of participation and social solidarity scores at baseline was different for intervention versus comparison respondents. Specifically, among comparison respondents, the mean social solidarity score at baseline did not have a statistically significant effect on hygiene index scores at final (p=0.81). In comparison, each standard deviation *increase* above the mean in the social solidarity score at baseline had a 0.24 unit *increase* on intervention community respondent's hygiene index scores at final. Further, each standard deviation *increase* above the mean in the participation score at baseline had a 0.23 unit *increase* on intervention respondents' WASH knowledge scores at final. In contrast, participation scores at baseline did not significantly affect WASH knowledge scores at final for comparison community respondents.

Table 13: Regression model summaries for H1b with interaction (Full Intervention v Comparison)

	Effect on WASH Knowledge n=521		**Effect on Hygiene Index n=476**	
	Model Summary		**Model Summary**	
	Estimate (95% CI)	***p*-value**	**Estimate (95% CI)**	***p*-value**
Baseline Participate	-0.29 (-0.75, 0.17)	0.22	-0.03 (-0.21, 0.14)	0.71
Baseline Participate x Intervention Arm	0.52 (-0.07, 1.11)	0.08**	0.06 (-0.17, 0.28)	0.61
Baseline Support	0.18 (-0.31, 0.70)	0.45	0.18 (-0.01, 0.38)	0.06
Baseline Support x Intervention Arm	0.18 (-0.59, 0.95)	0.65	-0.23 (-0.52, 0.07)	0.13
Baseline Trust	0.10 (-0.33, 0.52)	0.66	0.02 (-0.15, 0.19)	0.80
Baseline Trust x Intervention Arm	-0.36 (-0.95, 0.23)	0.24	0.01 (-0.22, 0.24)	0.94
Baseline Solidarity	0.09 (-0.28, 0.48)	0.61	-0.02 (-0.16, 0.12)	0.81
Baseline Solidarity x Intervention Arm	0.09 (-0.58, 0.77)	0.79	0.26 (0.01, 0.51)	0.04*

*Significant at p=0.05

**Significant at p=0.1

The model summaries for the multi-level linear regression models assessing the impact of the interaction between baseline social capital scores and the CHC intervention on WASH knowledge and hygiene index scores for the sub-sample of CHC member respondents are presented in Table 14. There was a marginally significant interaction between the intervention and baseline social support scores on average hygiene index scores (p=0.07). Specifically, for each standard deviation *increase* above the mean in the social support score at baseline, CHC member respondents had a 0.11 unit *decrease* on their hygiene index scores. In contrast, for each standard deviation unit *increase* above the mean in the social support score at baseline, comparison respondents had a 0.20 unit *increase* on their hygiene index scores. None of the other models had a signification interaction for the sub-sample of CHC member respondents.

Table 14: Regression model summaries for H1b with interaction (CHC Members v Comparison)

	Effect on WASH Knowledge n=418		Effect on Hygiene Index n=380	
	Model Summary		Model Summary	
	Estimate (95% CI)	*p*-value	Estimate (95% CI)	*p*-value
Baseline Participate	-0.33 (-0.79, 0.14)	0.17	-0.01 (-0.19, 0.17)	0.90
Baseline Participate x Intervention Arm	0.36 (-0.29, 1.0)	0.28	0.04 (-0.21, 0.28)	0.77
Baseline Support	0.18 (-0.32, 0.69)	0.48	0.20 (0.01, 0.39)	0.04*
Baseline Support x Intervention Arm	0.19 (-0.71, 1.09)	0.68	-0.31 (-0.65, 0.03)	0.07**
Baseline Trust	0.07 (-0.35, 0.50)	0.75	0.01 (-0.16, 0.18)	0.88
Baseline Trust x Intervention Arm	-0.24 (-0.87, 0.40)	0.46	0.02 (-0.22, 0.27)	0.86
Baseline Solidarity	0.11 (-0.27, 0.48)	0.58	0.01 (-0.13, 0.15)	0.94
Baseline Solidarity x Intervention Arm	-0.54 (-1.38, 0.30)	0.21	0.20 (-0.11, 0.51)	0.20

*Significant at *p*=0.0.5

**Significant at *p*=0.1

Hypothesis 2

The results of hypothesis 1a indicated that WASH knowledge scores significantly increased as a result of the CHC intervention (Tables 9 and 10). Therefore, we conducted analyses to determine if the effect of the CHC intervention on WASH knowledge was mediated by any of the social capital variables. Tests for mediation found that none of the hypothesized mediators were statistically significant mediators of the CHC intervention on changes in WASH knowledge scores (participation: *p*=1.61; social support: *p*=0.84; trust: *p*=0.29; social solidarity: *p*=1.65).

Qualitative Results

Sample Demographics

Table 15: Focus group discussion participant demographics

		Managers, Coordinators & Facilitators n (%)	CHC Members n (%)	Total Sample n (%)
Gender	**Male**	5 (45)	14 (44)	19 (44)
	Female	6 (55)	18 (56)	24 (56)
Marital Status	**Married**	3 (27)	4 (13)	7 (16)
	Living Together	0 (0)	8 (25)	8 (19)
	Single	8 (73)	18 (56)	26 (60)
	Engaged	0 (0)	2 (6)	2 (5)
Education	**None**	0 (0)	3 (9)	3 (7)
	Primary	0 (0)	6 (19)	6 (14)
	High School	4 (36)	21 (66)	25 (58)
	University	7 (64)	2 (6)	9 (21)
Age	**Average**	37	31	33

The focus group discussion sample demographics are presented in Table 15. Over half (56%) of the full sample and each sub-sample were female. The majority of participants were single and had completed high school. Among the CHC member sample, 9% (n=3) had no education and 19% (n=6) had completed primary school. All of the managers and supervisors had completed a university degree, while all of the facilitators had completed high school. The average age of the full sample was 33 years.

Major Themes

WASH Themes

The common themes that emerged from the analysis, along with a brief description and an illustrative quote, are presented in Table 16. Discussion participants described the goal of the CHC as organizing communities to promote health and prevent disease. As one CHC member stated, *'Here at KSK [Kleb Sante Kominote/Community Health Club] we take care of health issues'.* Participants explained that CHCs achieve this goal by disseminating key WASH and health information, promoting protective WASH behaviors, and encouraging participation in collective action to address community-wide issues. According to the participants, CHCs 'take care of health issues' by engaging members in weekly discussions about the relationship between diseases like diarrhea and WASH behaviors, and promoting changes in key behaviors like hand washing, drinking water storage, and open defecation to prevent disease (Table 16, members learn and members share). Another key message participants described was the value of working

Table 16: Major qualitative themes, descriptions and representative quotes

Theme	Description	Example
Knowledge, Behaviors and Collective Action		
Members learn	Club members learn about WASH issues and behaviors, with the stated goal of improving health by preventing disease. Topics include hand washing, defecation practices, drinking water practices and environmental management. Members also learn about the benefits of working together and using community resources to address communal WASH issues like water and environmental management.	'She taught us the importance of how to take care of our health and our community. How to purify bad water to drinking water. How to protect ourselves from certain diseases. She also [taught] us to wash our hands after coming from the bathrooms, and not to touch or put anything in our mouth without washing our hands. So, now we know what to do to avoid certain diseases.'
Members share	Club members share what they learn about WASH issues, behaviors and the health benefits of these behaviors with their family, friends, neighbors and other community members who did not join the Club. Members also share what they have	'The club is a small group of people living in the community, and their duty is to share and teach the other one who are not parts of the club. That is a way to influence the others. They talk to their neighbors on the farm about "the cat way" practice. Because the members

Theme	Description	Example
	learned about the benefits of working together and using community resources to solve problems.	are part of the community and wants to protect themselves and the community, they have to advise people not to do certain things so everyone can be safe and stay healthy.'
WASH behaviors	WASH behaviors, both before and after the Club was started, and the behavioral changes that have occurred because of the CHC. Descriptions include the behaviors and behavioral changes of both Club members and non-members. The most commonly discussed behaviors were hand washing and defecation, but drinking water and environmental management were also discussed.	'Now that I'm a part of the club I understand that when I wash my hands I avoid germs, so now I wash all the time because I don't want to catch any diseases.' 'Once you start educating them about defecation they take it very serious and try very hard to do it in a good condition. That means if they are doing "the cat way" practice it's momentary until they can build a real latrine, because they know the defecation on the ground can easily become a problem for his/her health.'
Collective action	People working together and supporting each other, both before and after the Club was started, and the changes in working together and social support that have occurred because of the CHC. Descriptions include the behaviors and behavioral changes of both Club members and non-members. People mostly worked together to clean their communities or fix potholes. Descriptions of social support included helping people when they are sick and watching people's homes or family members.	'In my community we did not have this, I did not see people working together, we did not believe in this. But, once we joined KSK we start learning how to get together to accomplish something for the community. KSK guides us to be more positive. So at this point we understand and we get closer to each other. To make things easy by working together. I personally became very addicted with the idea and started teaching my brothers and sister how to stop being selfish and learn how to work together. It's because of KSK that I learn to help people.'
Behavioral influences	The factors that influence and reinforce changes in WASH behaviors and working together, for both members and non-members. The most common factors included information, perceived and real health benefits, social solidarity and social pressure.	'And we get around graduation, we learned a lot, we became professional. We follow the advices and we did not catch any diseases. As you know there is lots of diseases out there, like cholera, and we did not get them.'
Social Capital		
Social solidarity	The ways in which people, typically Club members, share a unity of direction, goals and interests. These include implied and explicit descriptions of how people have the same mindset, beliefs and practices, as well as how the Club facilitated the creation of social solidarity.	'There is a slogan they use to say in the community before "*Zafè kabrit pa zafè mouton"* [The business of the goat is not the business of the sheep] …"*Your problem is not my problem*" But now they change it to "*Zafè kabrit se zafè mouton*" [The business of the goat is the business of the sheep]… "*Your problem is my problem*" That simply means if you catch a disease I can catch it from you too. Therefore, we need to protect each other and stay healthy. This slogan make a big change in the community.'
Trust	The levels of generalized and specific trust between people, as well as how, when and why people trust each other. This also includes descriptions of how	'It brings some trust but not to the whole community because not everyone are members of this club. But the members establish some kind of trust between them.'

Theme	Description	Example
	Clubs build trust within and beyond the Club membership.	
Bonding	The relationships that have been built amongst the Club members, including descriptions of who people know from within their community because they have joined a Club, the relationships that have been created between these individuals and the benefits of these bonding relationships.	'The first influence that I think the club brought in the community. The minute that they joined the club, they feel comfortable when they are learning and doing the activities, they feel very good. They feel like there is a link that binds them together and they feel stronger together.'
Social networks	General and specific descriptions of who people know and the relationships that have been created or reinforced because of the Club. This theme includes two sub-themes about bridging (with other community members who are not Club members) and linking (with people and resources outside the community).	'At the club we have all kinds of people, religious people, voodoo believers, educated and non-educated people...So they go around and start talking about the club and convince more people to join.'
Bridging relationships	How Club members build bridging relationships with the rest of their community. The most common methods by which members built these bridging relationships was by sharing knowledge, practicing and modeling behaviors, and engaging in collective action.	'So we meet other people in the community, we invite them in the club meeting and share the knowledge with them, so they can also share the information in their house.' 'I believe there is some kind of influence in my community. After we start doing some work in the neighborhoods like fixing potholes on the roads. We realized that people in the community joined us to help.'
Linking relationships	How Clubs create access to and how members utilize linking relationships with individuals, organizations and resources outside of their community, to address problems or to encourage more people to join a Club.	'The day of the graduation, there was all kind of people and important people involved, there were mayors, family members, friends and special guests and other organizations from different community.'

together to address general community issues and WASH problems specifically (Table 16, collective action). One CHC member explained why, *'Working alone won't take you far. By yourself you can be weak, but once we are together we are very strong. And we can move forward faster.'*

Members Learn

The participants highlighted new knowledge about the link between disease and WASH behaviors as an important reason why people changed hand washing and defecation behaviors (Table 16, members learn). Specifically, participants cited the ongoing threat of cholera as a strong motivator for change, as described by one CHC member, *'Everyone was afraid to catch cholera, so we wash even more.'* One CHC member described the role disease prevention played in influencing hand-washing behaviors (Table 16, WASH behaviors and behavioral influences), *'We realized it was good information because we had less diarrhea in our community. There were many*

other diseases that disappear in this area because we wash our hands way more than before.' The theme of disease prevention reinforcing behavior change was also associated with defecation behaviors (Table 16, WASH behaviors and behavioral influences), specifically the practice of fecal burial, or cat sanitation as the discussion participants called it. Further, participants explained how perceived health benefits, or disease avoided, contributed to behavioral maintenance. The participants regularly described how new behaviors became habitual when people realized they avoided diseases like cholera. One CHC member described becoming 'professional' with their practice of new behaviors.

Participants also described how the CHC taught them about the importance of and encouraged engagement in collective action (Table 16). The CHC promoted the importance of working together to solve problems, and guided members to collaborate and realize positive results. Working together was new for some people, as one participant described, *'Before we joined the club we use to work alone, but after we become involved with KSK and we get good advice from them, we realized that only working together can help us achieve something good.'* The members ultimately realized positive outcomes from working together. The most commonly cited forms of collective action were community clean-ups and repairing potholes. Although the participants mentioned addressing collective water and sanitation issues as priorities, they described technical and financial barriers as limiting factors.

Members Share

Participants explained that CHCs were not limited to learning, behavior change and working together as a CHC. As one member stated, *'Our role in KSK is to educate people in our community. To teach the good way to function'.* This good way of functioning included not just hand washing and safe defecation practices, but also coming together as a community to support each other and solve problems (Table 16, members share). CHC members explained how they were expected to share their knowledge with and model new behaviors for their family, friends and wider community. Although this sharing of information and promoting key WASH behaviors with the wider community might seem altruistic, the quote presented in Table 16 (members share) indicates a sense of self-preservation as it relates to changing collective norms. While the members wanted their family, friends and neighbors to learn the same information and receive the same benefits they realized as members, the members appeared equally motivated by protecting themselves from disease. The CHC members described how they felt an obligation to advise their community to practice certain behaviors, like fecal burial (e.g. cat sanitation), so they, the CHC members, can ensure their own health and safety.

Social Capital Themes

Social Solidarity

The most common theme related to social capital that participants discussed was an increased sense of social solidarity that the CHC engendered. This sense of social solidarity was epitomized by the national CHC 'slogan' that the participants mentioned with regularity throughout the discussions, *Zafè kabrit se zafè mouton*" [The business of the goat is the business of the sheep], i.e., *Your problem is my problem*", (Table 16, social solidarity). As the participants explained, WASH problems are collective problems and individual behaviors can affect everyone (e.g., where people poop and how they wash hands has the potential to directly and indirectly affect everyone). Thus, all WASH problems are collective problems. This slogan and the weekly CHC meetings brought the CHC members closer together and unified their way of thinking and acting. As one CHC member put it, *'we get together and become one'*. Importantly, the members realized that unity within their membership alone was insufficient. Thus, they also emphasized community outreach and education.

Social Networks

Participants perceived that CHCs facilitated the expansion of social networks by building relationships with people who might otherwise not interact. As shown in Table 16 (social networks), the CHCs brought people of different backgrounds, beliefs and educational levels together. Not only did the CHCs bring a wide cross-section of communities together, participants also perceived that CHCs contributed to healing fractured relationships. As one CHC member described, *'Since we started with the club, people act different, enemies become friends again.'*

Bonding

The participants described how once people joined a CHC, they built strong bonding relationships with each other. As explained in the quote in Table 16 (bonding), joining a CHC made people feel good and gave them a sense of strength and unity (social solidarity). In fact, many discussion participants used the word 'family' to describe the relationships between CHC members. Participants then described how the CHC enhanced social bonding over time as the members continued learning together and began collaborating to solve community problems. Participants explained how each success, in changing behaviors or working together, created a sense of pride, which further encouraged the members and reinforced social bonding. This was described by one CHC member:

'In the beginning people did not know, they did not have anyone to explain to them how important it is to work together, there was no one to influence them, there was no solidarity, and they end up working even harder. Then the club started influencing us by teaching us the importance of working together, and how we can move forward with our community by working together. Now they understand and more people joined the movement and people become more friendly to each other and they see the importance, how we can accomplish more together.'

Bridging & Linking

The participants also described how the CHCs used knowledge dissemination and collective action to expand their social network and influence others to join their CHC (Table 16, bridging relationships). All of the discussion participants described how working together to clean the streets, fill potholes, or address other communal problems led to non-members supporting these efforts. The participants also noted that the simple act of talking with people and promoting protective WASH behaviors expanded their relationships and social networks. Further, participants reported that more non-members joined a CHC as they realized benefits from the information they received, as described by one CHC participant:

'We learned and teach other people about it, after people know the importance, then more people get involved so they can avoid to catch diseases. They continue to come to the club meetings to learn more until we graduate.'

Finally, participants perceived that the end of program graduation ceremony also contributed to further bonding within CHC membership, and provided important linking relationships with other community members. One CHC member described the influence of the graduation ceremony, *'There were many other groups from different communities taking the same workshops and doing the same things. That make us feel good and made us more motivated'.* Members were encouraged to find others with the same knowledge, who had participated in the same CHC activities. They described being proud to be a part of a larger social network with a shared sense of social solidarity. Participants also described how the public graduation ceremonies encouraged the CHC members to continue sharing knowledge and encouraging people to join a CHC. While some non-members had already realized the program brought health benefits, respondents thought that the graduation ceremonies showed non-members the program was serious and could have positive social externalities, as described by one of the program managers:

'When they came for the graduation, they saw many people from other places and the members. Now they realized it is an important club, then they want to join, they trust us, they want to be a part of it. Even though they [were only] 20 to 30 people, in their mind its 20,000 people. You know Haitians love good appearances.'

As described above, the graduation ceremonies led to more people wanting to join a CHC. This desire to join a CHC was, at least in this manager's opinion, related to non-members perceiving the CHC program to be a large social movement and that joining a CHC would be prestigious and possibly confer some positive social benefits. The

perception of the importance of the CHC program was further reinforced at the graduation ceremonies by the presence of mayors and other important guests (Table 16, linking relationships).

Trust

Although CHC member participants felt they bonded with each other and sought to bring more people into their unity of thinking and action, they indicated that levels of generalized trust were low. A recurring theme throughout the discussions was of the high levels of trust within the CHC membership; however, generalized trust, especially trust in strangers, was low (Table 16, trust). For example, as explained by one CHC participant, *'We know the people in the club. We can trust them. But we cannot trust other people we don't know'.* Often, members, facilitators and supervisors defined their trust of other members through the lens of WASH practices, as described by one member, *'We received the same workshop and share the same knowledge and we understand each other. That means we have to trust each other in the club'.* As described in the quote, members have the same information and they should be practicing the same behaviors. Thus, they trust each other. One facilitator mentioned he would not drink water in the households of his CHC members before the CHC started, but after the CHC started, he began drinking water during household visits because he trusted his members were applying what they learned. Although generalized trust was low, the participants perceived that the members' efforts to educate their neighbors and engage them in the CHC activities developed more trust between the CHC members and non-members. This was described by one of the CHC managers:

> *'The club is actually reinforcing the trust idea because people did not used to sit together, and now they sit together and make decisions, and that increases trust in the club. Because people see that there are things happening like cleaning their neighborhood and other people join them to do it together, that means someone gets influence by the trust that exists in the club and the community.'*

Social Capital & CHCs

The above major themes described what people learned and how they shared what they learned as a member of a CHC, as well as participants' perceptions of the ways CHCs influenced social capital. The following section describes how participants understood and described social capital's influence on CHC membership and changes in WASH knowledge, behaviors and collective action.

Social Capital & CHC Membership

Although not conclusive, the themes described above implied that the CHC members were initially motivated to join a CHC because of a desire to learn how to maintain a healthy life and protect themselves from

diseases like cholera. The achievement of health outcomes and the strong social bonds generated by CHCs motivated members to participate and remain engaged through graduation.

The discussions highlighted three themes about social capital factors that influenced people to join a CHC: increased trust, non-member observations of and participation in CHC initiated collective action, and access to linking relationships. First, as described by one of the CHC members, '*Certain diseases don't come near this community because of KSK education. That increased people's trust and that encouraged more youth to join us and work together.'* The participants regularly described how the realization of improved health outcomes, in particular the prevention of cholera, led to the wider community's trust in the CHC and the information members shared. This in turn led more people to join a CHC. Second, as described by another CHC member, the visible presence of members working together also encouraged people to join, *'After we start doing some work in the neighborhoods like fixing potholes on the roads, we realized that people in the community joined us to help'.* Participants described how non-members would join the members when they observed the CHC working together. Non-member participation in collective action reinforced the trusting relationships that members had initiated through dissemination of knowledge information and promotion of WASH behaviors and led to non-members joining a CHC.

The final theme that emerged as influencing CHC membership was the role of linking relationships with CHC supervisors, facilitators and others from outside the community. These relationships appeared most often during discussions of the graduation ceremonies. One member described it this way:

> *'When they come for the graduation, they saw many people from other places and the members. Now they realized it's an important club, then they want to join, they trust us, they want to be a part of it.'*

Respondents indicated that when non-members attended the graduation ceremonies, they verified and validated the information they received from their members, but more importantly, they observed that the program had a wider influence than their community. This reinforced the trust they had in their own CHC and created a sense of 'missing out', which motivated more people to join what some discussion participants described as a 'movement'. The participants from two of the CHC member discussions also described linking relationships in relation to the weekly CHC meetings and visits from CHC facilitators, supervisors and managers.

In addition to social capital, a lack of incentives also emerged as a theme that limited participation. For example, as described by one of the facilitators:

'From my point of view it does not work well in all the community. Not how we want it to work. Some people are always expecting something else while you are trying to help them with good advice. I guess some don't believe in free advice. They are always expecting more than prevention advice! They want something else.'

As described previously, the primary purpose of the CHC program was to disseminate health knowledge and encourage behavioral changes. However, as a facilitator described, many people came to the CHC expecting more than information. Other discussion participants described how people came to the first few meetings, but did not return when they learned they would not receive food or other incentives.

Social Capital & WASH Knowledge, Behaviors and Collective Action

The themes of how social capital influenced WASH behavior change and collective action emerged from the creation of and discussions around the behavior over time graphs. Figure 5 is one of the behavior over time graphs created by CHC members during the focus group discussions that exemplified the themes. The figure is labeled with numbers to reflect the major themes and factors that emerged as influencing both WASH behavior change and collective action, which are described in detail below.

1. ***Initiate knowledge and awareness***. Participants indicated that the primary reason why people did not practice hand washing, safe defecation practices, and collective action prior to the start of the CHC was a lack of information. This was described by one of the CHC members, *'Here in the beginning people did not know the consequences and they did not have any information'.* In general, participants explained that people did not wash their hands or practice safe defecation practices prior to the start of the CHC program because they did not know why they should. Further, the participants indicated that the link between WASH behaviors and disease prevention, particularly cholera, was either unknown or unclear.

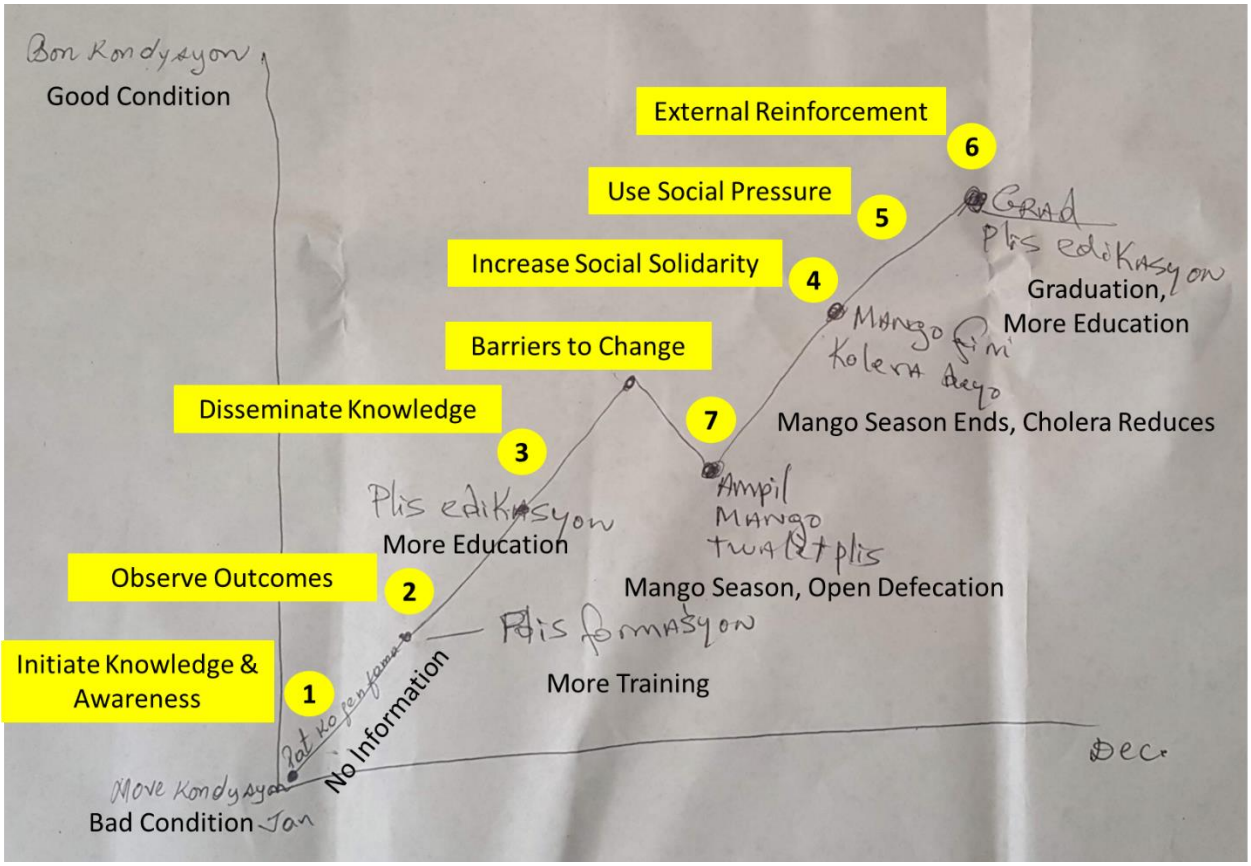
   Regarding collective action, participants in one of the member focus groups indicated that although they worked together prior to the start of the CHC, the program reinforced the importance of working together and gave people the opportunity to apply what they learned, as described by one CHC member:

   'This is the beginning of the club, at that time we used to help and work together but it was not that much, but longer we stayed in the club we got more knowledge and we understand how important it is to help and work together.'

   Once people joined a CHC, participants described how the members received information about WASH issues and the benefits of behaviors like hand washing and fecal burial. Participants perceived that the initial influence on CHC member behaviors was information. The members were then encouraged by the facilitators, and each

other, to apply their new knowledge and practice improved hand washing, defecation and collective action. The value of their newfound knowledge and promotion of collective action was captured by one club member, *'It's like we were living in a dark house. Once there is light, everyone can see. Now we can see how good it is to work as one community'.*

Figure 5: Annotated behavior over time graph from CHC member discussion about defecation behaviors



2. ***Observe outcomes.*** Participants noted that once they began practicing new behaviors they realized health outcomes. The influence of disease prevention was described by one member, *'Then we got more educated about it…and we saw the change in our health right away. Therefore we never stop washing'.* This participant described how upon practicing new hand washing behaviors they realized an immediate health benefit. The same theme emerged for defecation practices. The health benefits that participants most commonly described included the prevention of diarrhea and cholera. The end of the quote above also exemplified how a desire to maintain health benefits reinforced hand washing and defecation practices over time.

Observing health outcomes also created and reinforced trust in CHCs. One facilitator described this phenomenon:

> *'We gave them some good examples how dangerous it can be and what kind of diseases they can catch if they don't wash their hands after they defecate. And we teach them how to wash their hands, they put it in practice, and they trust us because they realized we are teaching them some good stuff about health.'*

Participants noted that once people applied what they learned and realized a health benefit, their trust in their facilitators and the information they shared increased. This resulted in members continuing to participate in the program, which strengthened social solidarity and the social bonds amongst the CHC members.

3. ***Disseminate knowledge.*** The participants indicated that they did not keep this new information to themselves. As described by one CHC member, the members also shared their new knowledge with and modeled their new behaviors for the rest of the community:

> *'When we get to third dot [referring to the behavior over time graph], we gather lots of people in the community and teach them the right way to do it…By the time we get to the fourth dot, we know a lot about this and we practically do it in a good condition all the time. Rarely can you meet some people who do it in bad condition. It's probably because they haven't met anyone from KSK to advise them.'*

Participants noted that sharing information and modeling behaviors resulted in non-members practicing the same behaviors. A common theme amongst the CHC member discussions, and as highlighted in the above quote, was that only people who did not have contact with any CHC members continued to practice poor hand washing and unsafe defecation practices. The participants also perceived that members sharing knowledge led to non-members increasing their trust in the CHC, as discussed in the following quote from a facilitator:

> *'It increases the trust because it's a positive thing that is happening. They did not know how to do many things to take care of their health, now they know how to take care of them, and they learn it for free. Think about that! That person will automatically trust you.'*

4. ***Increase social solidarity*.** Participants noted an enhanced sense of social solidarity within the CHC membership after they understood the potential influence of WASH behavior change and collective action on the wider community. This was explained by one of the CHC supervisors:

> *'Here was an old saying" Zafè kabrit pa zafè mouton" [the business of the goat is not the business of the sheep] that everyone disagreed with because when someone has a problem in the community, all of us who have problems.'*

The old saying was a common proverb in the community that promoted individualism and concern with oneself. As exemplified by the quote, it appeared that the members challenged the proverb and promoted a sense of unity in their CHCs and throughout their communities. As described previously, the participants perceived that

this sense of social solidarity played an important role in facilitating behavior change and in encouraging members to promote change in the wider community.

5. ***Use social pressure.*** As the CHC program continued, participants described how social pressure was used to ensure adoption and maintenance of new practices. For hand washing, this was described by one of the CHC managers:

> *'Everyone knows to have a tippy tap [home-made hand washing facility] at their house to wash their hands, and every club member starts watching each other to make sure they do what they need to do because the facilitator can stop by any time to supervise. It's like a family affair they advise each other to help each other save lives and at the end they get used to it so they do it all the time.'*

CHC members supported and observed each other to ensure everyone practiced the agreed upon behaviors. However, as indicated in the above quote, social pressure also came from visiting facilitators and supervisors. During household visits, member's homes were checked to see if they had built a hand washing facility and if they were practicing fecal burial or had built a latrine. As one member described, *'Everyone was watching and advising each other in the community'*. The use of social pressure reinforced behavioral changes and encouraged behavioral maintenance over time.

However, as described by one member, the use of social pressure was not limited to CHC members, *'After a while we didn't even need to tell people about it in the neighborhoods. Once they see us, they just get up and go wash their hands'.* The participant indicated that towards the end of the program, the members did not have to continue sharing information. They perceived that the member's visible presence in the community was sufficient to encourage non-members to wash their hands. The members were supported in this use of social pressure by their facilitators and supervisors, as described by one of the supervisors:

> *'They trust us when we are conducting meetings, there are always other supervisors from other community health clubs who come to visit us and advise us to live with each other. So! I believe they establish some kind of trust in us, they listen to us and they do what we tell them.'*

In addition to encouraging behavioral changes and collective action, the participants perceived that visits from supervisors and facilitators contributed to non-members increasing their trust in the CHC and adopting new behaviors.

6. ***External reinforcement.*** Finally, participants noted that the CHC helped create relationships with other CHCs, supervisors and important stakeholders, which supported behavioral maintenance and encouraged non-members to join. One member described this influence on hand washing behaviors, *'We saw other groups were involved. That encouraged us more. When we saw more people graduating and there were people from all over, we take*

that more serious'. Participants mentioned how learning there were other CHCs where different people from different communities were learning and practicing the same behaviors, reinforced the sense of social solidarity amongst all CHC members. This, in turn, increased their motivation to continue practicing new behaviors, disseminating information and promoting behaviors in their community. As previously mentioned, the graduation ceremonies also directly influenced non-member's behaviors and led some to join a CHC.

7. ***Barriers to behavior change*.** In addition to these positive influences on WASH behaviors and collective action, the participants identified two barriers that limited widespread behavioral changes: a lack of financial resources and seasonality. A few discussion participants mentioned a lack of financial resources as a limitation on hand washing behaviors (e.g. inability to purchase soap), while money was commonly cited as a factor that limited adoption of safe defecation practices. *'It is true they are doing much better than before, but they still do it in a bad condition. Because not everyone can afford to build a latrine'.* Lack of financial resources was a common theme, although the CHCs promoted fecal burial and considered this an adequate substitute while people saved money to build a latrine. Participants also mentioned a lack of funds as a barrier to CHCs engaging in collective action to improve access to safe drinking water. However, as one CHC facilitator noted, this barrier can be overcome:

> *'I observed something that happened in a neighborhood where there was a water project to wash clothes. There were many water pipes available so people could get water and wash their clothes. Unlike KSK that does workshop for the people to take good care of their community, the NGO just installed it and left without teaching the people how to use it. Of course, after six to seven months, many things were broken and the water was just wasting. But the difference with our club, we sit with the community and teach them the importance of water and help them take good care of it. So after it stopped working for a long time every one was having a hard time because they have to go far away to get water. Then, the club sat with the community, with the support of the mayor, and they bought the materials they needed and fixed it. The club members brought the solution for their community.'*

As exemplified by the quote, the CHC used their collective knowledge, motivation to work together to solve a problem, strong sense of social solidarity and linking relationships with the mayor to resolve an issue that others had previously failed to address. This passage also highlights the power that the participants realized from working together and using available resources to solve problems. For this CHC, the most important resource was the relationship they created with the mayor. However, discussion participants also described leveraging their member's knowledge, technical expertise and tools to repair roads, fix water pipes, and build latrines.

The second factor that limited widespread change in defecation practices was mango season. One of the facilitators described this, *'The mango season is the problem when all the kids are out there looking for mangos,*

they don't have time to go home and they have no other choice'. Every discussion mentioned mango season as a factor that contributed to children continuing to practice open defecation. Participants described how children looking for mangos would openly defecate because their homes were far away and latrines were not available. Even though the CHCs promoted fecal burial and use of latrines, the participants discovered that they could not ensure everyone consistently applied safe defecation practices.

Club Differences

The analysis also revealed three differences between CHCs with high social capital and low social capital (as measured quantitatively through the survey). Specifically, there were differences in themes related to trust, bridging relationships with the community, and the role of external influences on behavior changes.

Although the two CHCs with low social capital described strong bonding and social solidarity within their CHC membership, the participants in these discussions described less trusting relationships with their wider community than the two high social capital CHCs. For example, members of one low social capital CHC described these relationships as follows:

> *'Member: We trust people who are part of this group more than others. It's easier to trust people in the group.*
>
> *Discussion Facilitator: Do you agree with this statement? You think people trust each other in your neighborhood. Would you trust people to watch your house for you when you are not home for a few hours or couple of days? You guys don't trust each other in this community?*
>
> *Member: Not everyone. We cannot trust everybody.*
>
> *Discussion Facilitator: You only trust a few people?*
>
> *Member: Yes*
>
> *Discussion Facilitator: Ok! Since the club has been around do you believe there is an increase in the trust behavior?*
>
> *Member: Yes, there is more trust around us.*
>
> *Discussion Facilitator: I don't get it. This club just start last year. Why do you trust people in the club more than your neighbor? You have been living with your neighbors for a long time. Maybe 10 years or more.*
>
> *Member: Because we received some workshops in the group and the other people did not.'*

This passage highlights the theme about the relationship between trust and social solidarity. The participants describe how the members of the CHC trusted each other because they had the same knowledge and practiced the same behaviors. However, they did not trust the rest of their community because they were not confident everyone had the same way of thinking and acting.

These participants also described more difficulty building bridging relationships with the wider community. The general lack of bridging relationships, and the influence this had on behavior change, was described by on member from a low social capital CHC, *'Maybe the club influences it a little bit more. But I don't really believe it influences it that much, because not everyone in the community is part of the club. It's only a few of us'.* As this participant explained, change in the wider community was limited because their CHC did not have a large number of members. It is not clear if this perception of limited behavior change was a result of only the CHC members changing their behaviors (broad behavior change in the community was small because their membership was small) or of the member's inability to reach more people with their messages. Regardless, the result is the same, which is weaker social networks and trusting relationships resulting in lower adoption of new behaviors and limited engagement in collective action. One member from a higher social capital CHC provided potential insight into this theme, *'It's not a matter of club members and non-club members. This is a small community. We all work together. We are no longer selfish, we become one'.* According to this participant, community size is an important factor that influences a CHCs ability to build wide bridging relationships and encourage behavioral changes.

Finally, a lack of external support and influence also emerged as a contributing factor to lower rates of behavioral adoption (and by extension general social capital). Participants in the higher social capital CHCs raised the important role of visiting supervisors and facilitators on CHC member and non-member behaviors, but participants in the lower social capital CHCs did not raise this point. However, it is unclear whether this is because facilitators and supervisors did not visit these lower social capital CHCs or that participants in these CHCs did not perceive external actors as influential on behavior change.

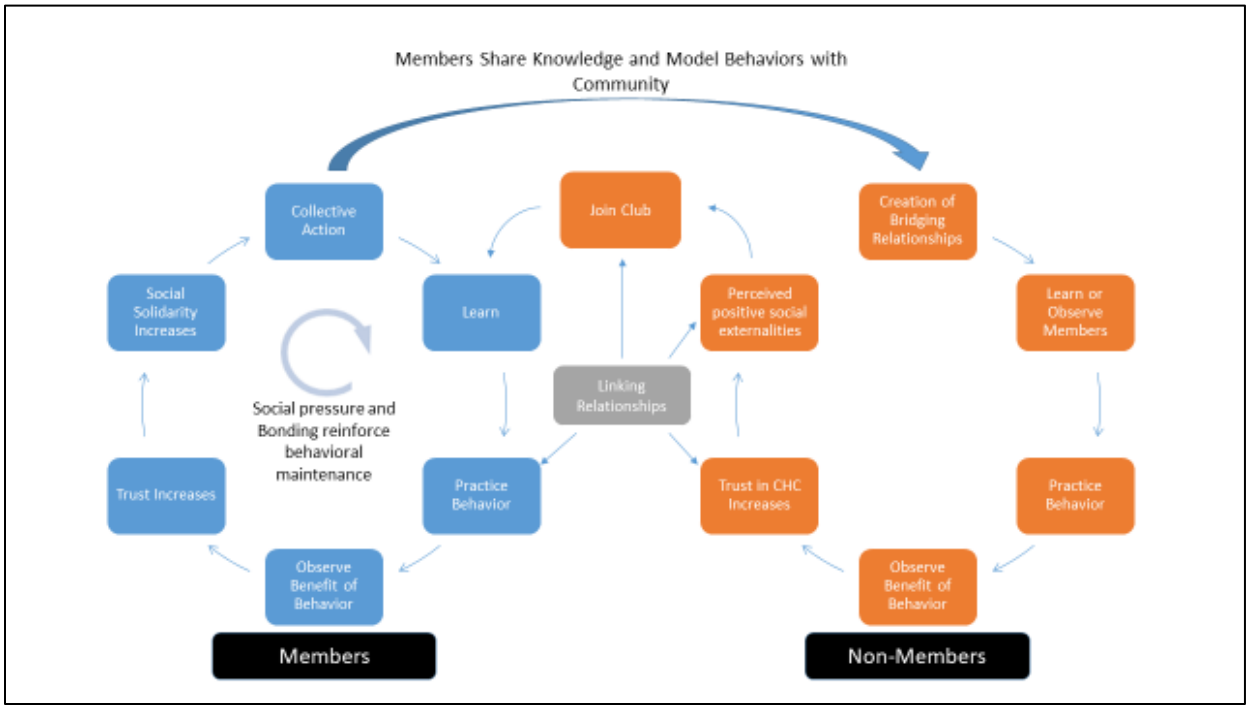
Conceptual Framework

Figure 6 is the consolidated framework that emerged from our results. The framework highlights the ways in which social capital, as generated through the CHC program, influences WASH behaviors and collective action in both CHC members and non-members.

Members first joined a CHC and began learning new information about the health benefits of WASH behavioral change and collective action. This new knowledge and a general fear of diseases like cholera led members to practice new behaviors, which led to the prevention of diseases. The realization of health benefits influenced the members trust in the CHC and the information they received, which contributed to a growing sense of

social solidarity and a commitment to engaging in collective action. This sense of social solidarity served to enhance the already strong social bonds the members had created by meeting together on a weekly basis to learn and build consensus about new behaviors and collective action projects. This process then resulted in the creation of a positive feedback loop where members were encouraged to continue attending meetings, practice what they learned, maintain newly adopted behaviors and collective action practices, realize benefits, and further enhance a sense of social solidarity. The members leveraged this social solidarity and strong social bonds to apply social pressure (e.g. household visits, verbal cues and modeling), contributing to the maintenance of newly adopted WASH behaviors and engagement in collective action. Finally, external influences, or linking relationships, in the form of visiting supervisors and participation in the graduation ceremony further reinforced these new behaviors and encouraged the members to recruit new people.

Figure 6: Conceptual framework of the relationships between the CHC intervention, social capital and WASH knowledge, behavior and collective action (CHC members and non-members)



CHC members also built bridging relationships with the wider community by sharing their knowledge and modeling new behaviors, both for altruistic (e.g. everyone should have good information) and self-interested (e.g. everyone must think and act the same to prevent disease transmission) reasons. When non-members learned new information and adopted new practices promoted by the CHC members, a similar positive feedback loop is created.

New practices lead to real or perceived health outcomes, which leads to increased trust in the CHC, an increased perception that the CHC carries positive social externalities, and subsequently, some non-members to join. Non-members were also influenced by the CHC members' use of social pressure, the linking relationships created by the CHC, and the end of program graduation ceremonies. Each of these factors reinforced the trusting relationships, which further enhanced the perceived positive social externalities, eventually leading to behavioral adoption, participation in collective action, and an increase in each CHC membership and social network.

CHAPTER 5: DISCUSSION

We divided our discussion into three parts. The first is our interpretation and contextualization of the quantitative results. The second is our discussion and interpretation of the qualitative results. The chapter concludes with a discussion of how the qualitative and quantitative data inform each other, the conceptual framework that guided our study, and the implications of our findings.

Quantitative Results

We used our quantitative data and methods to inform two specific aims and answer three hypotheses. The following is our interpretation of the results for each specific aim and hypothesis.

Aim 1: *Identify the effect of the CHC program on community member social capital and WASH knowledge and behaviors after a one-year intervention.*

Hypothesis 1a: *Intervention respondents will have significantly greater increases in social capital, WASH knowledge, and WASH behaviors after a one-year intervention than respondents in comparison communities.*

WASH Knowledge

The results of our regression analyses confirmed our hypothesis that intervention respondents would have significantly greater increases in WASH knowledge after a one-year CHC intervention. The average WASH knowledge scores for all participants in CHC communities increased from baseline to final, and the increase was significantly greater than that of the comparison sample for both the full intervention sample and the sub-sample of CHC members. This outcome is not surprising since the CHC intervention was an intensive health education program that consisted of 23 weeks of participatory health education activities. Further, differences in WASH knowledge between intervention and comparison respondents, as well as changes in WASH knowledge for intervention respondents, have consistently been reported in the CHC literature. For example, similar post-intervention differences in WASH knowledge between CHC respondents and non-CHC respondents were published in studies of CHC programs in Zimbabwe, Haiti, Dominican Republic (Brooks et al., 2015; Rosenfeld & Taylor, 2015; Waterkeyn & Waterkeyn, 2013; Waterkeyn & Cairncross, 2005). A program in the Dominican Republic

reported a significant increase in WASH knowledge scores from pre- to post-intervention amongst CHC respondents (Rosenfeld & Taylor, 2015). However, ours is one of few studies to have a comparison group, and thus strengthens evidence that the increase is a result of the CHC intervention.

WASH Behaviors

We rejected our hypothesis that intervention respondents would have significantly greater increases in WASH behaviors after a one-year CHC intervention. While the intervention respondents increased their average scores on the hygiene index from pre- to post-intervention, our regression model showed no significant effect of the CHC intervention relative to the comparison community respondents, who also experienced a significant pre- to post-intervention increase in their hygiene index scores. This was an unanticipated result, considering that change in WASH behaviors is the most commonly reported outcome in the CHC literature.

The reasons for this lack of significant change might be related to three factors: the presence of a national cholera prevention and control campaign, the use of a behavioral index rather than specific behaviors as an outcome, and the use of point-in-time observational measures. During the two years the CHC program was implemented, the Government of Haiti and its international partners were implementing a national cholera prevention and control campaign (Guillaume et al., 2018; Ministry of Public Health and Population, 2013). This campaign stressed similar messages to that of the CHC curriculum, particularly around hand washing, safe drinking water, safe defecation practices and use of oral rehydration to treat dehydration associated with diarrhea. As part of this national effort, communities across Haiti received similar information to that provided through CHCs as well as resources like chlorine for water treatment, buckets for water storage and in some cases latrines. It is highly likely that this campaign influenced both the WASH knowledge and behaviors in our comparison sample, which provides one explanation why average WASH knowledge scores for our comparison sample increased by almost two points from pre- to post-intervention.

In addition, this is the first time the hygiene index has been used to measure WASH behavior change in a CHC program. With the exception of one study, past evaluations measured and reported changes in WASH behaviors (e.g. presence of a latrine, presence of a hand washing facility, observations of latrine cleanliness, observations of hand washing practices) individually (Brooks et al., 2015; Ncube, 2013; Sinharoy et al., 2017; Waterkeyn & Waterkeyn, 2013; Waterkeyn & Cairncross, 2005; Whaley & Webster, 2011). Maksimoski &

Waterkeyn (2010) created a summative behavioral score, and reported results in categories of low, medium and high behavioral adoption. It is possible that the hygiene index in our study masked significant changes in specific behaviors (e.g. hand washing, fecal burial, drinking water storage).

Finally, the targeted behaviors were measured only at two points-in-time, pre and post-intervention. Although none of the previous studies of CHC programs measured WASH behaviors more than twice, observations of behaviors once at each major time-point may not capture variations due to contextual factors. It is possible that when the data collectors conducted their observations, other factors (e.g. seasonality, time, financial resources) influenced the target behaviors. Observations at multiple time points before and throughout program implementation would provide a more accurate measure of each specific behavior. It is worth noting that studies of CHC programs in Zimbabwe, Uganda and Rwanda documented significant increases in latrine construction amongst CHC households (Waterkeyn & Cairncross, 2005; Waterkeyn et al., 2009, 2005). This did not seem to be the case in our study, although we did not analyze rates of individual latrine construction and use in our study.

Social Capital

We also rejected our hypothesis that intervention respondents would have significantly greater increases in social capital after a one-year CHC intervention. Interestingly, the regression models showed that the CHC intervention had a significant negative treatment effect on the trust and social solidarity scores in the sub-sample of CHC members. This is the first time that social capital was quantitatively measured as an outcome of a CHC program specifically, therefore we cannot compare these results to any past studies. However, in one study of Community Led Total Sanitation (CLTS), the authors found that the CLTS intervention contributed to increased social capital, but only in those communities with high levels of pre-existing social capital (Cameron et al., 2015).

The negative treatment effect on trust and social solidarity scores among CHC member respondents may be due to attention bias issues. For example, it is possible that respondents had not considered issues of trust and social solidarity when surveyed at baseline. They then participated in an intensive one-year program that increased their social networks and emphasized social solidarity and collective action (see qualitative results). When asked the same questions again at post-intervention, it is possible that the respondents were more attuned to these issues and gave more thoughtful and deliberate responses. In addition, the specificity of the social capital measures is important to note. The questions about trust, social solidarity, and social support measured perceptions of general, community-

wide trust, social solidarity and social support. These questions did not measure trust, social support and social solidarity specifically within the CHC membership.

Hypothesis 1b: *Intervention respondents will have significant increases in WASH knowledge and behaviors, independent of baseline social capital, after a one-year intervention.*

The purpose of this analysis was to assess whether baseline social capital measures were significant in association with changes in WASH knowledge and behavioral outcomes over the course of the one-year CHC program. The results of the regression models partially confirmed this hypothesis. The average change in WASH knowledge scores for respondents in both the full intervention sample and the sub-sample of CHC members were not influenced by any of the baseline social capital scores. However, baseline social solidarity scores did have a marginally significant impact on changes in average hygiene index scores at post-intervention for both the full intervention sample and CHC member sub-sample. This result might be related to the CHCs focus on disseminating information widely throughout the community and the CHC member's use of social pressure to promote behavior change. A strong sense of social solidarity prior to the start of the intervention could have given the CHC members more confidence to share their messages widely. Further, baseline social solidarity could facilitate the use of social pressure to promote behavioral changes and maintenance over time. Cameron et al (2015) reported a similar result, where communities with high social capital prior to implementation of a CLTS intervention were more successful in applying social sanctions in support of changes in defecation practices. However, the authors did not report which specific dimensions of social capital influenced participant's use of social sanctions.

We also ran regression models to determine whether baseline social capital interacted with the CHC intervention to influence average changes in WASH knowledge and behavior. Our models of the full intervention sample showed that there was significant interaction of baseline participation scores and baseline social solidarity scores with the CHC intervention. Our results indicated that a combination of the CHC intervention and baseline participation scores contributed to increases in WASH knowledge scores at final. This relationship appears logical. If a community is civically engaged and willing to participate in community-wide activities, they could be predisposed to join a CHC where they gained new knowledge. Further, this predisposition towards group membership may be an indication that people were members of other groups that disseminated similar information, reinforcing what they learned in the CHC. Our results also indicated that the CHC intervention and baseline social

solidarity scores contributed to increases in hygiene index scores at final. Similarly, if a community has a strong sense of social solidarity, community members may be more willing to change individual behaviors to align with new collective norms and be susceptible to the application of social pressure to achieve behavior change.

In the CHC member sub-sample, the results of the regression models with interaction showed a marginal interaction effect of the CHC intervention and baseline social support scores on hygiene index scores at final. This result indicates that the combination of the CHC intervention and baseline social support contributed to a decrease in hygiene index scores amongst CHC member respondents. This was a surprising outcome, as we might expect the opposite. If CHC members felt a greater sense of social support within their community prior to the intervention, one might think these helping relationships would contribute to greater behavioral changes at final as members support each other in the implementation and maintenance of new behaviors. With that said, the conceptual link between social support (e.g. helping neighbors with childcare or assisting someone who is sick) and WASH behavior change, is less clear than that of social solidarity.

Aim 2: *Examine the mediation effects of social capital on CHC participant's WASH knowledge and behaviors.*

Hypothesis 2: *Social capital will partially mediate the effect of the intervention on participant WASH knowledge and behaviors.*

Our final set of regression models were designed to measure whether social capital mediated the effect of the CHC intervention on average changes in WASH knowledge scores. We did not run models using the hygiene index as the dependent variable since the results of our first regression models indicated the intervention had no effect on average hygiene index scores. None of our models showed a significant mediation effect on WASH knowledge scores, meaning there was no direct causal sequence between the CHC intervention, changes in social capital (trust, participation, social support and social solidarity) and changes in WASH knowledge scores. Based upon the results of our initial regression models, where the CHCs had no effect on trust, participation, social support and social solidarity scores, this mediation result is not surprising. While our study did not show that CHCs impact social capital, our interaction models did demonstrate that CHCs use social capital to facilitate change. Finally, as we discuss in the limitations, our results were limited by the evaluation study design and sample size, which the evaluation consultant did not design or power to answer our specific hypotheses.

Qualitative Results

Aim 3: *Describe participant and implementer perceptions of how social capital influences community engagement in the intervention as well as WASH knowledge, behaviors, and collective action.*

To achieve this aim, we conducted six focus group discussions with members of a purposive sample of CHCs, facilitators of the sampled CHCs, and the managers and supervisors of the program in the Central Plateau. We then used a combination of inductive and deductive methods to identify common themes, analyze the relationships between those themes, and develop a conceptual framework. Our framework demonstrates the ways CHCs generate social capital and how social capital influences WASH behavior change and collective action. We divide the following discussion into two main parts: the influence of CHCs on social capital and the influence of social capital on CHC outcomes (CHC participation, WASH knowledge dissemination, WASH behavior change, and WASH collective action).

CHCs and Social Capital

Our results, as summarized in our conceptual framework presented in Figure 6, show how discussion participants discussed aspects of both structural and cognitive social capital. CHCs create and reinforce social networks manifested in learning and action that are unified by a sense of common unity. The act of learning and taking action together, whether to change behaviors or address community-wide issues, leads to increased trust and confidence, and a general sense of pride when health outcomes are observed and problems are solved. CHCs expand social networks first by bringing people together of different backgrounds and perspectives who bond as members of a CHC. Networks then expands outwards as CHC members, driven by an increasing sense of social solidarity with the wider community and a desire to prevent disease, build bridging relationships with non-members by sharing knowledge, modeling behaviors and initiating activities to address collective problems. The following is a discussion of the broad themes related to structural and cognitive social capital and the CHC program, in particular: strong social bonding through creation of social solidarity, the creation of wide social networks, and high degrees of internal trust, but low degrees of generalized trust.

Structural Social Capital

Bonding. The strongest theme that emerged from our analysis was how CHCs create strong bonding relationships. In the social capital literature, bonding relationships or bonding social capital refers to trusting

relationships and resources that are accessed within social groups who see themselves as being similar or share a social identity (Kawachi, Subramanian, & Kim, 2008; Szreter & Woolcock, 2004). Participants in our discussion described how CHC members created tightknit bonds with each other, often describing their relationships using terms like close friends or family. These bonds were initially created by having the members sit together on a weekly basis to learn, identify problems, build consensus around solutions, and then take action. This bonding capital was then reinforced by a growing sense of social solidarity (e.g. unity of thinking and action), that was at least in part related to creation of a new social identity, epitomized by the CHC slogan, *Zafé Kabrit se Zafè Mouton* (The Business of the Goat is the Business of the Sheep). This slogan is an adaptation of an old, but commonly known Haitian proverb (The Business of the Goat is not the Business of the Sheep), which promotes staying out of others affairs. However, as the participants regularly mentioned, only when entire communities have unity of thought and action, when the collective norms around WASH behaviors and working together have been changed, can a community truly be healthy and free of disease. Thus, they changed their perspectives on this traditional proverb and used the CHC slogan as the foundation upon which they built their new social identity. Interestingly, this slogan and social identity not only facilitated bonding within CHCs, but it also helped individuals feel connected with members of CHCs in other communities. Previously published studies of CHC programs in Zimbabwe, Sierra Leone and urban Haiti also showed qualitatively how CHCs formed strong social bonds, which led to an enhanced sense of social cohesion, and increased supportive behaviors (Azurduy et al., 2007; Brooks et al., 2015; Ncube, 2013; Waterkeyn, 2006; Waterkeyn & Cairncross, 2005).

Bridging. Another strong theme that emerged from our analysis was the breadth of the social networks CHCs created. CHCs welcomed all people regardless of education, faith, gender or age. However, once a CHC was formed, participants described how the members continually sought to expand their social networks by promoting CHC messages, behaviors and collective action in the wider community. This desire to spread knowledge and engage the rest of the community was at least in part related to the growing sense of social solidarity engendered by the CHCs. In these ways, the CHCs facilitated the creation of bridging social capital, which refers to relationships and resources that are shared between people who know they have different social identities or demographics (Kawachi et al., 2008; Szreter & Woolcock, 2004). Some participants even described how CHCs helped repair fractured relationships, making ‘enemies friends again’. While the participants did not provide explanations as to why and how the CHCs developed these wide relationships, it is possible that WASH is an appropriate topic to

engender such relationships. Specifically, WASH issues are not controversial, and they have the potential to affect everyone. Furthermore, cholera outbreaks had created a sense of fear and urgency for prevention, which had been a threat in Haiti's Central Plateau since 2010.

Linking. CHCs not only facilitated internal bridging relationships within each community, but they also generated external bridging and linking relationships with other CHCs and stakeholders. Linking capital or relationships is a sub-set of bridging capital that describes relationships that cross explicit power or authority gradients (Szreter & Woolcock, 2004). Participants from two of our CHC discussions mentioned the important role that visitors to their community, particularly other CHC supervisors and facilitators, in supporting knowledge dissemination and behavior change. A supervisor also described how one CHC used its social networks to invite their mayor to a meeting, which resulted in the CHC resolving a long-standing water delivery challenge. Participants often described these linking relationships within the context of the end of program graduation ceremonies, where members gained access to other CHCs and invited dignitaries in attendance.

Cognitive Social Capital

Trust. Another common theme the participants discussed was the high degree of trust amongst members and the low degree of generalized trust. Throughout the discussions, participants described how trust in their fellow Haitians used to be high, but that now they felt they could only trust other CHC members, their immediate family, friends and close neighbors. Interestingly, this trust amongst CHC members was often viewed through the lens of WASH behaviors. They trusted each other to have safe drinking water, to defecate safely and to wash their hands, but they could not trust that others do the same. High levels of trust were another factor that contributed to increased social solidarity and strengthening the bonds amongst the CHC members. However, according to the participants, strangers could not be trusted. The participants did not provide reasons for this low generalized trust, but they implied that ongoing social, political and economic instabilities in Haiti were contributing factors. This appears logical as economic insecurities in Haiti have contributed to high social mobility (internal and external migration to countries like the Dominican Republic, the United States and Chile most recently), as well as increases in social and political violence, which could undermine generalized social trust (Charles, 2018; Semple, 2018). While the evidence on the relationship between political and economic instabilities and social capital in least developed countries is limited, there is literature describing the impact of the most recent international financial crisis in

Europe. One study analyzed levels of trust in Greece and found that generalized trust in political and impartial institutions declined substantially, while interpersonal social trust did not (Ervasti, Kouvo, & Venetoklis, 2019). Another study of trust during the financial crisis in the Netherlands reported a decrease in generalized social trust (van der Cruijsen, de Haan, & Jansen, 2016).

Social Capital and CHC Participation

Our results did not provide insights into the role social capital played in influencing people's decision to join a CHC when the program started. However, facilitators were trained to recruit members using their existing social networks, and although we do not have empirical evidence, CHC implementers/administrators anecdotally indicate that people tend to join if members of their family or their friends become members. The qualitative results did, however, shed light on one major influence on why people maintained their membership over the one-year program. Fear of cholera and a desire to prevent disease was a theme the discussion participants commonly associated with CHC membership. People's desire to learn how to protect themselves and their family from cholera likely brought them to the CHC, but in addition to receiving good information, members also built stronger social bonds with a wider network of people. Strong social bonds manifested into trust and a sense of solidarity, which motivated members to continue participating in the six months of weekly meetings. The social bonds and a sense of solidarity were reinforced by the realization of positive results, predominantly the prevention of disease and the use of collective action to address problems.

We also learned that both internal and external forces influenced non-members decisions to join a CHC. Internally, the CHC member's efforts to disseminate information, model new behaviors and engage in collective action contributed to non-members decisions to join. When non-members followed the members' guidance and practiced new behaviors, they also observed positive health outcomes. This led to an increase in trust in the CHC, resulting in more people attending meetings and eventually joining a CHC. Also, CHC members engaged in collective action, which had a similar influence; whereby, non-members would join in the effort, realize a benefit, develop more trust in, and join the CHC. Externally, site visits by program leadership and the graduation ceremonies influenced non-members decisions to join. Community visits by CHC facilitators, supervisors and managers legitimized the CHCs and increased non-member's trust in the program. This trust was once again reinforced by the public graduation ceremonies, where non-members could independently verify the CHCs messages. Further,

participants described how the graduation ceremonies also led some to realize that CHC membership carried social prestige. As some participants described, non-members desired to be a part of a larger social movement, a phrase that appeared in two of the discussions, or alternatively, a fear of missing out, motivated some to join a CHC. The respondent's use of the word movement is important because it highlights the themes of social bonding and social solidarity, which other studies have also found to play a role in influencing people to join and maintain CHC membership. For example, Waterkeyn (2006) also described in her PhD dissertation how CHCs in Zimbabwe led members to have a sense of pride and to perceive an enhancement in their social standing.

Our results also identified one barrier to CHC membership: lack of material or financial incentives. A common theme that emerged was that of people coming to the initial CHC meetings, but never returning when they learned that they would not receive any material handouts. The need for incentives is a common issue in Haiti, and especially relevant to WASH programs that have historically given people buckets, soap, latrines and chlorine for water treatment. This approach to programming appears to have contributed to external dependencies and poses a threat to programs like the CHC that focus on knowledge transfer, behavior change, and self-sufficiency within the community. This is a critical consideration for WASH behavior change, as will be discussed in more detail below. However, our results also indicated that this barrier was not insurmountable. When people who did not join a CHC realized health benefits or noted the social prestige that came with CHC membership, the discussion participants reported some joined a CHC.

Social Capital, WASH Knowledge and Behaviors

Ultimately, the strongest theme that emerged from this analysis is that CHCs are primarily about learning and sharing knowledge. However, it is impossible to discuss knowledge without simultaneously discussing behavior change. As became clear from our findings, CHCs did not focus on education as an end to itself. Members were encouraged to engage in praxis, or the practical application of knowledge in the form of behavior change (Freire, 1970). This is essential because as our results indicated, it was the application of knowledge in the form of behavior change (e.g., hand washing with soap, defecation practices, home-made oral rehydration, water treatment) that led to observable health benefits and increased members trust in the information they received and each other. It appeared that members felt they could trust their drinking water was safe, hands were washed, and that latrines were being

used (or fecal burial was being practiced), which strengthened their social relationships, sense of social solidarity, and wider dissemination and promotion of behavior change throughout their communities.

This growing sense of social solidarity also enabled CHCs to use social pressure to promote adoption and maintenance of new behaviors. As mentioned above, members expected and trusted that all members were washing their hands, protecting their drinking water, and defecating safely. This expectation was reinforced by household visits where members would ensure everyone had built a home-made hand washing facility and observed the environment in which each lived. This internal social pressure was reinforced by external influences, primarily site visits by facilitators and supervisors. The site visits appeared to influence behaviors of both the members and non-members alike. We should note that although our results highlighted the role that social capital played in facilitating behavioral changes, it appears that fear of cholera and a desire to prevent disease was a strong underlying motivation for change.

Our results identified a few barriers to WASH behavior change that have implications for CHCs and social capital. Regarding broad WASH behavior change, the thematic differences between high and low social capital CHCs in this sample indicated that the size of a CHC influenced bridging relationships and linking relationships. Common themes in the discussions with the members from communities with lower social capital included recognition of the small size of CHC membership, a general lack of trust in people outside of the CHC and a lack of knowledge about the impact of the program in the wider community. These themes imply that these CHCs were not as successful in building bridging relationships with the wider community. This could be due to low membership as a proportion of total population (small community size was noted as a positive factor in building bridging relationships in one high social capital CHC) or CHC membership that had weak or limited social networks. We also noted the absence of any discussion about the role of linking relationships, in particular site visits from facilitators, supervisors and managers, in the discussion in lower social capital communities. However, the role and importance of the graduation ceremonies was noted in all the discussions. The site visits and graduation ceremonies were not only a form of social pressure the CHCs use to encourage members to adhere to behavioral changes, but appeared to legitimize the CHCs, their information, and their activities in the eyes of non-members. A lack of such external influences might explain lower behavior change and limited CHC membership in the lower social capital CHCs. We

do not know, however, whether these visits did not happen in these two CHCs or if the participants did not perceive such visits to be important.

The second barrier to behavior change that we found was related to latrine construction. Regardless of people's desire for latrines, the participants mentioned a lack of money in almost all the discussions as a barrier to latrine construction. Our data implies that latrine construction was limited during this project. In comparison, the results of CHC programs in equally poor areas of Zimbabwe and Uganda have noted high rates of latrine construction over one year of implementation (Waterkeyn & Cairncross, 2005; Waterkeyn et al., 2009, 2005). Although the CHCs in Haiti developed strong social bonds, a sense of social solidarity, and were able to successfully apply social pressure, these factors were not sufficient to push people towards latrine construction. It is possible that limited financial and material resources, combined with external dependencies created by prior WASH approaches (i.e., where materials were supplied for free), created substantial barriers.

Social Capital and Collective Action

CHC engagement in collective action was also directly related to the promotion of praxis in CHCs that we previously described. Although one CHC mentioned how their community worked together prior to the start of the intervention, the other three CHCs mentioned that working together for a common good was a new concept. The process by which CHCs came to engage in collective action, and the influence of social capital, was similar to that described above. Again, a sense of social solidarity was a driving force. A common theme throughout the discussions was a perception that people were stronger together than alone. This sentiment, combined with the idea that communal problems require communal solutions, pushed members to work together to clean their communities, fix potholes, address water delivery problems (in one CHC), and bring streetlights to the community. As with behavior change, the realization of positive results reinforced trusting relationships and encouraged members to continue working together. The member's visible presence working in the community also pressured non-members to collaborate with the CHC, which resulted in increased trust and possibly in more people joining a CHC.

Our results on collective action are similar to those reported in the CHC literature. Whaley and Webster (2011) described how CHCs created social bonds and resulted in an increased likelihood of members supporting each other and working together. Further, the collective activities described in these discussions are similar to those reported in the CHC literature. Others have qualitatively described CHCs in Zimbabwe and urban Haiti working

together to clean their communities (Brooks et al., 2015; Munyoro, 2016; Ncube, 2013), and CHCs in South Africa and the Democratic Republic of Congo working together to solve water delivery challenges (Beesley & Feeny, 2016c, 2016a, 2016b; Rosenfeld, 2008). We build upon this evidence base by showing how social capital influences engagement in collective action via CHCs.

Combined Results

The combined results of our study provide evidence in support of the two conceptual frameworks developed by Bisung and Elliot (2014) and Carpiano (2006) that guided this research. Bisung and Elliot (2014) hypothesized that social capital, via enhanced trust, shared norms and expectations, and community engagement, via groups and social networks, leads to improved social cohesion and collective action around community WASH issues. Both frameworks suggest that WASH interventions must first generate social support by expanding social networks, which then leads to increased social control (ability to use positive and negative social pressure to ensure adherence to norms and practices) and social leverage (ability to sanction or praise social behaviors and norms). Trust is generated, which leads to increased collective action and improved WASH knowledge and behaviors. While our quantitative results did not demonstrate that the CHC intervention had an effect on social capital, we did find that baseline social solidarity had an effect on final WASH behaviors, and that the CHC and social solidarity scores interacted to effect final WASH behaviors. Our discussion participants reinforced our quantitative findings as they described how the CHCs expanded people's social networks, created strong social bonds, and engendered a sense of social solidarity and identity. This led to more trusting relationships and, in support of Carpiano's framework, the member's use of social pressure to promote behavior change and participation in collective action.

The social capital and WASH literature also noted that trust and group participation were necessary to realize positive outcomes in WASH interventions, and that high baseline social capital might be necessary (Bisung & Elliott, 2014; Bisung et al., 2014; Cameron et al., 2015; Kähkönen, 1999). We found a quantitative relationship between baseline participation scores and WASH knowledge, but not WASH behaviors. However, the themes that emerged from our discussions in the two low social capital CHCs seem to support the importance of trust and group participation on WASH behavior change. In both communities, participation in the CHC intervention was low, trusting relationships were limited, and social networks were small, which the participants perceived as limiting wider changes in behaviors and collective action. Regarding the role of baseline social capital on achievement of

positive WASH outcomes, our quantitative results were mixed. Our hypothesis was that baseline social capital was unimportant because the CHC program generates social capital. We were able to confirm our hypothesis for WASH knowledge, as none of the social capital dimensions had an effect on final WASH knowledge scores. However, for WASH behaviors, we found that social solidarity was significantly associated with higher scores on the hygiene index at the end of the CHC program. However, we did not assess the role of baseline social capital on changes in social capital at final. Our qualitative results provided evidence in support of our hypothesis, as the participants described increases in social capital in all the communities; however, they also suggested nuances in how social capital is created within and extended beyond the CHC membership. It appeared that social capital is generated in the CHC among participants who are initially motivated to join, but a community's baseline social capital may have more of an influence on the ability of a CHC to disseminate information throughout broader community networks.

Our results advance this literature in three important ways. First, CHCs, at least qualitatively, appeared to create social capital and social capital appears to play an important role in disseminating WASH knowledge, facilitating WASH behavioral changes, and encouraging collective action via CHCs. Much of the social capital and WASH literature to date has focused on the relationship between social capital and WASH infrastructure. Our results join the small literature base describing the influence and role of social capital on WASH behaviors. The second is the important role social solidarity plays in this process. Quantitatively, social solidarity was the only dimension of social capital that influenced WASH behaviors, independently and in conjunction with the CHC program. This finding was explained by our discussion participants who described how social solidarity facilitated the creation of trust, reinforced bonding relationships, promoted bridging relationships, and more importantly, contributed to behavior change and collective action. This sense of common unity that the CHC program generates, as epitomized in the national slogan, appeared to play an important role in motivating behavior change and encouraging engagement with the wider community. The final way our study advances our understanding of the role of social capital and WASH programs, is the role of external influences via linking relationships. None of the literature to date has mentioned external, linking relationships. Site visits by facilitators and supervisors encouraged CHC members and provided a form of social pressure that, as the participants described, helped ensure adoption and maintenance of new behaviors. More importantly, however, was the role of the graduation ceremony, where members and non-members alike came to realize the program was bigger than their individual CHC and potentially

had wider social implications. Again, these qualitative findings support the quantitative role social solidarity, operationalized by the use of social pressure, played in influencing WASH behavior change.

Although our study answered many questions, we were not able to address two components of the original conceptual framework. A key component of Carpiano's framework (2006) is the role of community and individual influences on the creation of social capital. We did not address the role of community and individual level influences on engagement in the CHC program nor on the creation of social capital. Although we controlled for individual factors like gender, age, education, household income, household size, and years of residence in our regression models, we did not have the statistical power to explore the specific roles these factors played in influencing social capital or WASH outcomes. We did not have any community level characteristics like the religious composition of the community, average household income, or average residency length in the quantitative database, but future analyses should consider aggregating such variables to explore these relationships. We were also unable to draw a conclusion about the role of pre-existing social capital on the generation of additional social capital and on the role CHCs play in the operation and maintenance of WASH infrastructure. Finally, an area of inquiry that has recently opened in the WASH literature is the role of self-efficacy in facilitating behavioral change, and collective-efficacy in supporting collective action (Delea et al., 2018; Delea, 2019). These are all areas for future investigation as they relate to CHCs, social capital, and WASH outcomes.

Limitations

Our study has five main limitations, three related to our quantitative data and two related to our qualitative data. First, our quantitative data were collected as part of a program evaluation that was not designed with our specific research question and hypotheses. For intervention research, it is recommended to determine the sample size based upon the effect size of a primary outcome variable, in this case WASH knowledge and/or behaviors. However, the evaluation used a sampling strategy designed to obtain results that would reflect the population, not to ensure the ability to detect differences between groups. Therefore, the study was not properly powered to measure the effect of the intervention on WASH behaviors, not to mention the effect on social capital.

The second limitation of our quantitative data was the fact that this evaluation appears to be the first use of these social capital measures in Haiti. We are not aware of how these measures were tested and validated prior to data collection and it is possible that the questions were misinterpreted or misunderstood by the study participants.

With that said, we were encouraged by the fact that our PCA results showed factor loadings around the four main constructs the evaluation included in the survey (trust, social solidarity, group participation and social support). As another limitation, the evaluation survey did not include the complete suite of social capital measures from the World Bank's SOCAT tool. Measures of information and communication, social cohesion and inclusion, and empowerment and political action were not included. We advocate for further testing and contextual refinement of these measures before inclusion in future evaluations and studies.

The final limitation of our quantitative results are the real world implications of the results of our regression models used to answer hypothesis 1b. We detected what appeared to be small changes in average scores on WASH knowledge and the hygiene index based on baseline social capital scores. Furthermore, although the social capital measures were standardized, they are somewhat abstract concepts and it is difficult to assess the potential variation and change that may be expected in them. Thus, the practical significance and implications of the associations we observed remain unclear.

For our qualitative methods, our sample size was relatively small and two of our CHC member discussions were either abridged or rushed due to weather. Over the two-year program, 35 CHCs were formed and graduated members. While we included all of the program managers and supervisors in our focus group discussions, we only sampled four CHCs (11% of the total). Positively, we sampled CHCs to be representative of all CHCs across the four communal areas where the program was implemented, and our inclusion criteria was purposively driven by quantitative data about changes in WASH knowledge, behavior and final social capital scores. Furthermore, although the sample of CHCs might not be representative of the entire cohort of CHCs implemented under the program, the managers and supervisors discussion provides a thread that we used to make broader generalizations. Finally, two of our CHC member discussions were influenced by weather, which either forced an early conclusion to the discussion (one discussion did not finish the last behavior over time graph) or forced the discussion to continue under less ideal conditions (e.g. participants standing together on patio).

CHAPTER 6: PLAN FOR CHANGE

This study provided evidence in support of our hypothesis that social capital contributed to the dissemination of WASH knowledge, facilitated WASH behavioral changes, and encouraged collective action within a CHC program in Haiti. These findings have global implications for CHC programs and for international WASH research priorities. In the following chapter, I provide recommendations in these two areas, a rationale for why I promote specific changes or actions, a description of whom my recommendations target and detailed plans for facilitating change.

Recommendations

Table 17: Recommendations for CHC program implementation, monitoring and evaluation, and global WASH research priorities

CHC Implementation Strategies	CHC Monitoring & Evaluation	Global WASH Research Priorities
Leverage CHC member's sense of social solidarity.	Develop program theory and comprehensive CHC logic model.	Further research into the impact of CHC programs globally.
Refine CHC facilitator and member recruitment strategies.	Update and align global monitoring & evaluation indicators, tools and strategies.	Further research into the relationship between social capital and WASH programs.
Leverage concern of infectious disease outbreaks (e.g. cholera) for recruitment and behavior change.		Develop social indicators for WASH programs.
Address self-efficacy issues as related to latrine construction.		

My recommendations, which I categorize into CHC implementation strategies, CHC monitoring and evaluation and global WASH research priorities, are summarized in Table 17. Since the data from my study are specific to Haiti, my recommendations for CHC implementation strategies are most relevant to organizations utilizing the CHC model in Haiti. However, I believe these recommendations are relevant to organizations implementing CHCs in other countries and settings. Further, my recommendations for CHC monitoring and evaluation, which target global practitioners of the CHC model, provide the best way to understand which implementation strategies can be applied across countries and sites. Finally, successful implementation of my first

two sets of recommendations feed directly into my final set of recommendations on global WASH research priorities.

CHC Specific Recommendations

The primary targets of my recommendations for implementation strategies are the leaders of Lakou la Santé foundation, specifically leadership of Eco-Eau et Jeunesse Haiti and the Center for Medical Humanities & Ethics in San Antonio. However, as previously stated, I believe these strategies have relevance and implications for other organizations implementing CHCs in other countries and settings. To my knowledge, these include Africa AHEAD (Zimbabwe, Rwanda, Uganda and South Africa), Living Water International (Haiti), and Pull for Progress (Burkina Faso).

Program Strategies

Leverage Social Solidarity. My combined results indicate that social solidarity, which grows from strong social bonds and trusting relationships within CHC membership, is an important factor contributing to both WASH behavior change and engagement in collective action. CHCs leverage this solidarity, and the trust it engenders, to change the norms around hand washing, defecation and collective action behaviors, and to use social pressure to promote adoption of and adherence to new behaviors over time. Further, study participants perceived CHC membership provided some form of social advantage or prestige, particularly amongst non-members who attended the graduation ceremonies. I recommend that CHC programs in Haiti explicitly use social solidarity, the prestige of membership and social pressure to motivate people to join CHCs and subsequently facilitate wider changes in WASH behaviors and collective action.

I suggest operationalizing this recommendation using actions that are both internal and external to the CHCs. First, once formed, CHC members should be encouraged, and possibly required, to visit each other at home to ensure adherence to agreed upon practices. These visits should align with the topics covered, so as one series of topics (e.g. hand washing, drinking water, defecation) is completed, members visit each other. Second, each CHC should be required to make public statements at CHC meetings and community-wide meetings that describe the behaviors they consider safe or recommended. Such pronouncements will give the members, and the wider public, a way to keep each other accountable using social pressure. Externally, my data showed how important community site visits were as another form of social pressure, which encouraged CHC members to practice and maintain new

behaviors. These visits also legitimized the CHC's messages and activities in the eyes of the wider community. This led to increased trust in the promoted messages and behaviors, as well as to perceived increases in membership. Therefore, we recommend that program managers incorporate monthly site visits to every CHC. These visits should not be limited to CHC program staff, but should also include leaders of governmental and non-governmental agencies, which will further enhance the perception that CHCs are prestigious organizations and expand the linking relationships CHCs need to address more complicated or technical challenges.

Refine Recruitment Strategies. My quantitative results indicate that prior group membership and civic engagement moderates increases in WASH knowledge through the CHC. As I described in my discussion, this could be related to a predisposition to join groups like the CHC, where they gained new knowledge, or that the other groups disseminated similar information that was reinforced by the CHC. Regardless of the reasons why, this is knowledge the program managers in Haiti should take advantage of during facilitator identification and member recruitment.

Since the CHC facilitators are the entry point for community mobilization, the managers should identify and recruit facilitators who are already members of groups and, as a result, have wider social networks. Then, the facilitators, with the help of CHC supervisors and managers, should prioritize recruitment of members from these existing groups and use those networks to reach deeper into the community to recruit individuals who do not normally participate. I recommend identifying and recruiting opinion leaders from faith institutions, traditional leadership structures, educational institutions and the business community. Further, visits during recruitment from external stakeholders like the managers and coordinators will increase the perceived prestige of the program and trust in the facilitators, facilitating wider recruitment. This strategy does run the risk of concentrating information within a small network of 'participators'. However, I believe this risk is addressed by the longitudinal nature of the program, where CHCs take continual membership throughout the one-year WASH curriculum and beyond.

Leverage Concern of Infectious Disease Outbreaks (e.g., Cholera). A consistent theme from my qualitative results was fear of cholera encouraging members to remain engaged throughout the one-year program and motivating changes in hand washing and defecation behaviors. Since cholera is now endemic in Haiti, and will not be eliminated until the social and structural determinants of transmission are sustainably addressed, the CHC managers, supervisors and facilitators should leverage this fear to motivate membership and behavior change.

The program managers and supervisors should first emphasize the ongoing threat of cholera, and the ways in which CHCs address this threat during facilitator training. The facilitators should continue this messaging during community mobilization and member recruitment so people will associate CHCs and cholera prevention. The presence of the managers and supervisors during recruitment should, as described above, build people's trust in this message. The CHC managers should also consider including testimonials from facilitators and members from other CHCs who have previously completed the WASH curriculum as additional social reinforcement. Finally, the program managers should consider launching new CHCs at the beginning of the cholera transmission season, which generally occurs at the beginning of each year (UNOCHA, 2019). This way, the threat of cholera might motivate more people to participate and change their behaviors.

Latrine Self-Efficacy. My final recommendation for program implementation in Haiti is to address barriers to latrine construction. The participants in my focus group discussions regularly noted people's inability to build latrines due to a lack of money. While CHCs promote fecal burial, this is a temporary solution and, as noted by our participants, was not widely adopted by non-members, especially children. As mentioned in my discussion, this was an interesting outcome considering that CHC programs in Zimbabwe, Uganda and the Democratic Republic of Congo all reported member initiated construction of latrines (Beesley & Feeny, 2016b; Waterkeyn & Cairncross, 2005; Waterkeyn et al., 2009, 2005). If CHCs hope to prevent the spread of cholera in intervention communities, the program should promote more sustainable sanitation solutions and address issues of self-efficacy.

I recommend two approaches that align with Haiti's national sanitation strategy, which no longer allows non-profit organizations or governmental agencies to construct latrines for households (Direction Nationale d'leau potable et de l'assainissement (DINEPA), 2014). The first is to provide CHC members with the technical knowledge and skills to construct a homemade latrine with readily available, low-cost materials. Although the WASH curriculum equips members with knowledge about the sanitation ladder and the different technologies they could utilize, learning the theory of latrine construction does not necessarily translate into action. Therefore, I recommend that the program managers design a two to three day practical skills workshop at the conclusion of the one-year program. This training should equip members with the skills to construct a household latrine by working together to construct demonstration latrines. At the conclusion of the workshop, each member should create an action plan that describes his or her plan and timeline for constructing a latrine at home. The second is to train local artisans or

skilled laborers to construct latrines and create local markets for delivering low-cost sanitation technologies. Such sanitation entrepreneurs have been successful in Kenya and Indonesia (Aubrey, 2009; Gero, Carrard, Murta, & Willetts, 2014; Murta, Willetts, & Triwahyudi, 2018). Lakou la Santé could seek help from local Haitian organizations like SOIL, who have successfully created a sanitation business in Cap Haitien (Russel et al., 2015; Tilmans et al., 2015).

Monitoring & Evaluation

The stakeholders for whom I make my recommendations about CHC program monitoring and evaluation are the leaders of organizations that implement and evaluate CHC programs globally. Therefore, my specific plan for change targets the global community of CHC practitioners and program evaluators, which includes Lakou la Santé, Africa AHEAD, Living Water International, Pull for Progress, and social science/public health researchers. A global focus on monitoring and evaluation strategy contributes to our strategy for broader change in the international WASH strategy and research agenda described in the next section.

Logic Model. As described by Waterkeyn (2006) and Waterkeyn and Waterkeyn (2013), the CHC model draws upon multiple behavioral theories, including the Health Belief Model, the Theory of Reasoned Action and Planned Behavior and Social Learning Theory. However, the ways in which these theories are used and the specific ways the different dimensions influence WASH outcomes have not been comprehensively described. To my knowledge, the CHC program does not have a logic model that describes the program's theory of change. Logic models are an essential component of successful behavior change programs as they communicate the pathways by which change is theorized to occur. Logic models serve two primary functions. The first is to describe how a program works, which outcomes to expect, and the pathways by which outcomes are achieved. The second is to guide program implementers in the creation of monitoring and evaluation strategies (Frechtling, 2007; Funnell & Rogers, 2011; Rogers, 2008). I recommend the creation of a program logic model for both reasons. Further, I found evidence that social capital constructs like trust, social solidarity and group/civic participation, which are not directly included in the above-mentioned behavioral theories, play a role in facilitating change within CHCs. I provided a conceptual framework that demonstrates the relationship between the CHC, social capital, and WASH outcomes (Figure 6), which will be used to guide creation of a program logic model.

Update Indicators and Tools. I also recommend updating the CHC program monitoring and evaluation indicators and tools. I provide a few specific recommendations based upon the evidence from our study as well as the lessons we learned about the quality and utility of existing indicators and tools. I provide these recommendations only as a starting point and recommend that those responsible for CHC programs globally also utilize any new indicators developed as part of the CHC program logic model. For now, I recommend changes to the measurement of social capital constructs, of the behavioral observations used in the hygiene index, and the creation of strategies to measure individual and collective change.

First, I recommend measuring social capital in two ways, specifically within CHC membership and more generally in the community. Despite strong qualitative evidence indicating that social capital increased in intervention communities, I was unable to measure these changes quantitatively. One potential explanation is that the evaluation tool measured trust, social solidarity and social support generally throughout the intervention communities, while the perceived changes in social capital my discussion participants mentioned occurred specifically within the network of CHC members. To address this limitation, I recommend measuring social capital both within CHC membership (e.g. levels of trust, social support and social solidarity between members) and more generally within the wider community (e.g. general levels of trust, social support and social solidarity).

I also noted two potential issues with the hygiene index data that need to be addressed: the frequency of data collection and a lack of specificity in which behaviors changed. The hygiene index was calculated from data collected via direct observation at two points in time, baseline and final. This approach raises questions of reliability and validity. If it rained the day the observations were conducted, then there would obviously be standing water around a house. If the observations were conducted in the morning, it is possible the kitchen had not been cleaned. To improve the reliability and validity of these observations, I recommend collecting behavioral observations five times throughout the six-month WASH curriculum. Baseline and final measurements should be collected as part of the evaluation protocol, ideally measured several random days over a one week period, while the remaining three rounds of observations should be integrated into the facilitators and supervisors monitoring plan. Facilitators should include the members in their behavioral monitoring visits, both to reduce the workload and to leverage the role of social solidarity and social pressure in behavioral adherence, as described above. With multiple observations,

program managers and evaluators can triangulate individual behaviors over time, which will provide more confidence in the results.

I also recommend reporting both composite hygiene index scores as well as individual behavioral observations. I believe that the hygiene index is a useful research indicator allowing for more robust statistical analyses and indicator of overall change. However, this indicator masks changes in individual behaviors. This is not useful for program managers, since the hygiene index does not show which behaviors changed and by what proportion within the population. This limits organizational learning and program refinement. Further, individual behavioral indicators would allow program managers to tease out the relative impact of different dimensions of social capital on different behaviors.

I have two additional recommendations for CHC program monitoring and evaluation; one related to measurement of collective action and another more general to the evaluation methods. The quantitative data I used did not measure collective action. As a result, I could only describe this result qualitatively. I learned that CHCs in Haiti engaged in collective action to clean up their communities, repaired roads and addressed drinking water delivery. I recommend adding questions that measure individual participation in these specific activities. Regarding general evaluation methods, I also recommend creating a community leadership survey and including a sample of comparison respondents from within intervention communities. A community leadership (e.g. faith leaders, political leaders, CHC leaders) survey will complement the household survey by providing these individual's perspectives on community-wide changes in WASH behaviors, collective action and social capital. The community leadership survey could also include measures from the community readiness model to rigorously determine the stage where each community is, both before and after the CHC intervention, in terms of addressing specific health and WASH issues (Edwards, Jumper-Thurman, Plested, Oetting, & Swanson, 2000; Kelly et al., 2003). Further, inclusion of an internal comparison sample, individuals and households that did not directly participate in the CHC program, would allow for measurement of the intervention's spillover effects on WASH knowledge, behaviors, collective action and social capital. Such data would provide evidence of the wider changes the program contributes to within intervention communities, further informing the model's theory of change.

Global Alignment. My final recommendation is to align monitoring and evaluation indicators and tools across CHC countries. One of the challenges I noted in my literature review and discussion is the inability to compare outcomes

of CHC programs across countries. Some programs only reported changes in hand washing, defecation and drinking water practices, while others reported changes in kitchen hygiene and environmental management. Further, mine is the only study of a CHC program that has reported results of a composite hygiene index. Although use of a similar index has been reported in the WASH literature (Jeyakumar & Ghugre, 2017; Stevenson et al., 2009; Webb et al., 2006), the evidence of the utility of this approach is unclear. I believe there is utility in reporting both a composite score and changes in individual behaviors, assuming that evaluation strategies utilize behavioral observations at multiple points in time during implementation. Finally, my results indicate there is a relationship between social capital and CHC programs. I therefore recommend the inclusion of social capital measures in evaluation protocols across countries and sites.

International WASH Research

The stakeholders for whom I make my recommendations about WASH research strategies include WASH implementing agencies, public health and social science researchers, WASH donors and WASH policy makers. The following is an illustrative list of specific stakeholders within each category. WASH implementing agencies include non-profit organizations like UNICEF, CARE International and Catholic Relief Services. Specific research institutes include the University of North Carolina's Water Institute, Emory University's Center for Global Safe Water and Ewag. Finally, WASH donors and policy makers include USAID, the Gates Foundation, the World Health Organization, and the Pan American Health Organization.

CHCs and WASH Outcomes

The evidence of CHC program impact remains inconsistent, particularly as it relates to changes in WASH knowledge and behaviors as primary outcomes. Although my study demonstrated no effect of the CHC intervention on WASH behaviors, I did document a significant impact on WASH knowledge. The only other published study of CHCs in Haiti reported significant differences in WASH knowledge and non-significant differences in WASH behaviors between intervention respondents and comparison respondents in urban Haiti. I am encouraged by these preliminary results, particularly the qualitative data where participants reported perceived increases in WASH behaviors, and recommend further investigation of the impact of CHC programs in Haiti.

The global evidence of the impact of CHC programs on WASH outcomes varies, but the literature suggests that CHCs do have an effect on both WASH knowledge and behavior. However, as I mentioned above, each study

utilized different methods, indicators and tools, and have shown varied results. My monitoring and evaluation recommendations address this issue. Although it is useful to compare the impact of a program against the status quo, I also encourage comparative studies, where the outcomes of CHC programs are compared to the outcomes of other WASH interventions. To date, only Whaley and Webster (2011) have published such a study, comparing a CHC program to a CLTS program in Zimbabwe. Although the results for the CHC program were encouraging, particularly for short-term outcomes, this was an isolated study in a country where CHCs have been implemented by the same organization for two decades. A similar study should be conducted in Haiti, where the government has recently launched a national WASH strategy using principles CLTS. Comparative studies provide essential data that policy makers and donors can use when developing national strategies and funding priorities.

Finally, one limitation of the current evidence on CHCs, and on WASH programs more generally, is documentation of sustained behavior change and health impact. Again, only Whaley and Webster (2011) have attempted to measure the sustainability of WASH behavioral changes. The remainder of the literature documented changes before and immediately after the conclusion of the program. I recommend designing studies that measure whether individuals sustain these changes over time. Further, only one study of a CHC program in Rwanda assessed the impact of the program on diarrhea and acute respiratory infections in children under five (Sinharoy et al., 2017). More evidence of the health impact of CHC programs is needed to influence policy makers and donors.

Social Capital and WASH

My study was the first to quantitatively measure the relationship between social capital and a CHC program. My study showed that group participation and social solidarity moderated the impact of the CHC on WASH knowledge and behaviors. I recognize that the data used in my analysis, and the methods used to collect the data, were designed to evaluate the CHC program and not with our specific aims and research questions in mind. However, my qualitative data showed that participants and implementers perceived a relationship between social capital and the CHC program in Haiti. Therefore, I encourage more intentional research, using appropriate methods, sample sizes, and measures of social capital, into the relationship between social capital and the CHC program. Such research will help program implementers and evaluators better understand the pathways by which CHCs achieve change in WASH behaviors and collective action, thereby facilitating improvements in program delivery and evaluation.

I also recognize that my results inform the broader WASH literature and will influence research priorities across the WASH sector. The existing literature shows that WASH behavior change programs, like CLTS, affect and are affected by social capital. Therefore, I encourage implementers, researchers and program evaluators of other WASH behavior change programs to continue this line of inquiry. The actions described in my plan for change, specifically the consolidation of CHC indicators and tools, will contribute to this effort by providing comparable outcomes across countries and programs.

Social Indicators & WASH

My final recommendation is the creation and promotion of a consolidated set of social indicators for WASH researchers and evaluators to use when assessing the impact of WASH interventions. While the focus of my research was on the relationship between social capital and WASH outcomes, I recognize that other researchers are exploring the role of other social constructs. These include concepts of collective efficacy, social identity, social support, and social cohesion, some of which clearly overlap with dimensions of social capital (Delea et al., 2018; Delea, 2019; Harter, Mosch, & Mosler, 2018). The literature is beginning to show that a combination of social constructs and factors influence and are influenced by WASH programs, and in turn influence WASH behavioral and infrastructure outcomes. Therefore, as tools are refined and the evidence grows, we recommend creating a consolidated set of social indicators that practitioners and evaluators can draw upon when designing evaluation protocols of WASH interventions.

Plan for Change

Now that I have outlined my major recommendations and the stakeholders for whom I make these recommendations, I turn my attention to the specific action plans that will facilitate change. Leading change can be challenging. Oftentimes, individuals and organizations resist change because the rationale for why change is needed is not clearly communicated, the vision for why and how change will result in different outcomes is not clear, or simply because maintaining the status quo is easier and more comfortable. While much has been written about organizational and systemic changes, I found John Kotter's (2007) eight steps for leading organizational change provided a useful framework for leading change at the three levels our recommendations target.

Kotter offers eights steps, based upon lessons learned from failed efforts at leading change, that leaders should follow when setting out to transform an organization: 1) establish a sense of urgency; 2) build a coalition; 3)

create a vision; 4) communicate the vision; 5) empower others to act on the vision; 6) plan for and create short-term wins; 7) consolidate improvements; and 8) institutionalize new approaches (Kotter, 2007). In the following plan for change, I provide specific information and actions for each step. In addition, I feel that changes in CHC program implementation will be reinforced and informed by changes in global CHC monitoring and evaluation, which in turn will directly influence the recommendations and plan for change in international WASH research. Table 18 provides a summary of my specific actions as they align with Kotter's eight steps, each of which are described in more detail below as related to our three broad areas of recommendations: CHC program implementation, CHC monitoring and evaluation, and global WASH research strategies.

Establish Urgency

I will use the following key messages to communicate and establish a sense of urgency around the need for change.

Implementation Strategies: Cholera, which was introduced as a novel pathogen in Haiti in 2010, is now endemic. Since 2010, the Government of Haiti has confirmed 819,000 cumulative cases of cholera and 9,789 deaths from cholera (UNOCHA, 2019). Although the lowest numbers of annual cases and deaths from cholera were observed in 2018, the threat remains and seasonal spikes are the norm. Progress in addressing cholera is a direct result of a coordinated effort from the Government of Haiti, the Pan American Health Organization, UN agencies and international partners who are following the national cholera control and prevention strategy. Haiti's National Drinking Water and Sanitation Directorate (DINEPA) contributes to this strategy with its national water and sanitation strategy that emphasizes self-supply sanitation, and water rehabilitation and construction. However, progress in increasing access to safe drinking water and sanitation remains slow, particularly in Haiti's Central Plateau and high-density urban areas where CHCs currently exist. While the CHC program has achieved popular interest, my study has shown that the model's ability to affect behavior change and stimulate self-supply sanitation is limited. Lakou la Santé must focus on improving implementation fidelity, as outlined above, to achieve wide-scale behavioral changes, increase self-supply sanitation, and empower communities to take ownership over their own health and development. While the Government of Haiti and its international donors and partners have expressed interest in the CHC model, the window of opportunity to influence national strategies and policies is closing and the

Table 18: Specific actions to achieve change in CHC implementation strategies, CHC monitoring and evaluation, and WASH research strategies as aligned with Kotter's steps to leading change

Steps to Leading Change	Implementation Strategies	Monitoring & Evaluation	WASH Research Strategies
1. Establish Urgency	• Cholera is not going away • CHCs not yet achieving stated goals	• CHCs not widely adopted globally • Social lens differentiates CHCs • SDGs provide an opportunity	• SDGs provide an opportunity • Social, political and environmental change create challenges/opportunities
2. Build a Coalition	• Lakou la Santé Foundation leadership	• Lakou la Santé Foundation • Africa AHEAD • Pull for Progress • Academic research institutes	• Academic research institutes • Gates Foundation • USAID • WHO/PAHO
3. Create a Vision	• Virtual meetings • In-person meetings in Haiti	• Quarterly online meetings • End of year conference	• Side event at UNC Water and Health conference
4. Communicate the Vision	• Haiti team meetings that include leadership from San Antonio and Haiti	• CHC specific blog or website • International conferences • Write articles for publication	• UNC Water and Health conference proceedings • Write opinion pieces or editorials
5. Empower others to Act	• Allow supervisor and facilitator input • Trainings • Encourage innovation	• Disseminate logic model • Create and disseminate standardized monitoring & evaluation guide • Trainings, workshops and lectures	• Trainings and workshops • Create and disseminate recommended research methods, tools and indicators
6. Plan and Create Short-Term Wins	• Create peer clusters within CHCs • Reminders that cholera remains a threat • Develop facilitator recruitment criteria • Documentation of changes and impact	• Publish three manuscripts • Create unified CHC logic model • Validate logic model and indicators in CMHE and Africa AHEAD programs	• Develop WASH and social construct literature database • Refine methods, tools and indicators • Test methods, indicators and tools
7. Consolidate Improvements	• Review data and lessons learned at bi-monthly CHC team meetings • Consolidate data and lessons learned at monthly leadership meetings	• Consolidate feedback, data and lessons learned • Publish collective findings online, in peer reviewed journals, and at conferences	• Consolidate feedback, data and lessons learned • Write white papers and publish literature review • Refine indicator list, methods and tools
8. Institutionalize New Approaches	• Update and disseminate CHC training manual • Refresher trainings for supervisors and facilitators	• Update and disseminate CHC training manual • Add supplemental monitoring & evaluation guide to manual	• Publish findings from research and literature review • Advocate for adoption of WASH social construct indicators

model will only be adopted more broadly when policy makers and donors have confidence the CHCs will achieve the model's stated goals.

Monitoring & Evaluation: The CHC model has been available as a WASH behavior change strategy for over 20 years and has been used in countries across Africa, Asia and the Caribbean (AfricaAHEAD, 2019). However, the CHC model has not been widely adopted within the WASH sector. This is due to a lack of unified measures of knowledge and behavioral change, inconsistencies in reported outcomes, and the use of evidence from non-experimental study designs. Further, with a growing body of evidence demonstrating the relationship between social factors, like social capital, and WASH interventions and outcomes, it is time for CHC practitioners to integrate social change into the program theory and adopt social capital indicators as programmatic outcomes. Doing so will not only set the model apart from other community-based WASH education and behavior change programs, but it will also elevate the CHC model in international discourse and remind donors and policy-makers that a model already exists to affect both WASH and social change. The challenges associated with changing WASH behaviors and improving WASH infrastructure is not going away. In fact, the challenge is even greater now than before, as the Sustainable Development Goal's (SDG) now aim to achieve 100% coverage of the world's population with safe drinking water and sanitation facilities. Delivering programs and services to remaining areas without access will be even more difficult (United Nations, 2019). The SDGs focus on horizontal programs that address the social and structural determinants of health provide an opportunity to draw donor's and policy maker's attention to the important role that CHCs play in addressing WASH specifically, but also in laying the social and structural foundation for community engaged and centered health and development.

WASH Research: The SDGs have set an ambitious target of universal access to safe and affordable drinking water, sanitation and hygiene, and the end of open defecation by 2030 (United Nations, 2019). Unfortunately, progress towards these goals remains slow. According to the most recent estimates, 29% of the global population lack access to safe drinking water, 61% lack access to safe sanitation facilities, 892 million continued to practice open defecation, and we do not have valid data on household hand washing practices (WHO & UNICEF, 2017). As the growing body of evidence shows, social constructs like social capital appear to play a role in facilitating change, but we still do not fully understand which constructs are most important and how social factors influence different WASH outcomes. Further, achievement of these goals will be affected by social, political and environmental factors.

We already know that climate change affects access to and the availability of safe drinking water, which in turn could contribute to increased migration, which will further stress already stressed regions (Calow et al., 2011; Howard et al., 2010; Sherpa, Koottatep, Zurbrügg, & Cissé, 2014). These factors are and will continue to be exacerbated by fractures in social life based upon religion, ethnicity and gender, where vulnerable populations will continue to be marginalized. Each of these issues can only be addressed through changes in social structures and political systems. We must use the limited time remaining in the SDG era to more clearly understand the relationships between social constructs and WASH outcomes, which programs influence and are influenced by these constructs, and how WASH programs can potentially contribute to greater social cohesion and civic engagement.

Build Coalition

Implementation Strategies: I, as the CHC program lead in San Antonio, along with the leaders of the EEJ organization in Haiti, will form the coalition responsible for effecting changes in implementation strategies in Haiti. Since this leadership team is split between San Antonio, Texas and Port-au-Prince, Haiti, I will begin our conversations about implementation strategies virtually using WhatsApp, and will then continue our work in Haiti in preparation for new rounds of implementation.

Monitoring & Evaluation: I will take the lead on forming a coalition that consists of the leaders of organizations currently implementing CHCs or researchers/evaluators interested in social epidemiology and WASH programs. These include leaders of the Lakou la Santé foundation (San Antonio and Haiti), Africa AHEAD (Zimbabwe, South Africa, Rwanda, Uganda), Living Water International (Haiti), Pull for Progress (Burkina Faso), and interested social science or public health researchers from research institutions like the University of North Carolina's (UNC) Water Institute, Emory University's Center for Global Safe Water, the London School of Tropical Medicine and Hygiene or the Eawag aquatic research institute. Since these stakeholders are located around the world, I will first build this coalition virtually, using email and internet-based conference solutions like Zoom or Skype.

WASH Research: This coalition should consist of researchers and implementers with similar interests in WASH and social constructs, but with different skills and training. Such entities should include program implementers from Lakou la Santé, Africa AHEAD, and UNICEF; researchers from the UNC Water Institute, Emory's Center for Global Safe Water or Eawag institute; representatives from the Gates Foundation and USAID; and representatives from the WHO and PAHO. Building a coalition of stakeholders from a wide range of institutions can be difficult;

this coalition should be established at an international conference like UNCs Water and Health Conference. The first step in this process has already been achieved as I, along with a group of interested researchers and program implementers, have submitted a proposal to the UNC Water and Health conference for a side-event that will explore the current evidence on the social indicators and WASH programs.

Create a Vision

Implementation Strategies: Lakou la Santé's leadership team should use my study as a starting point for a broader discussion about program implementation strategies and implementation fidelity. Through WhatsApp messaging and conference calls, I will work with our leadership team to consolidate these findings along with other issues each member has observed with what has worked and not worked with CHC implementation. The goal of these initial conversations, which should happen over the course of one month, is to develop a clear vision of what changes to implementation strategy, in addition to those recommended here, are needed, how to operationalize those changes, and how to measure the impact of those changes. We will finalize this vision the first time we are together in Haiti together, ideally within six months of initiating this conversation.

Monitoring & Evaluation: I will organize two meetings in the first quarter of the coalition's formation. These meetings will serve to build consensus around the need for developing a logic model, updating the monitoring and evaluation tools, and setting a vision for how the CHC model can have one unified logic model, for conducting more research and evaluations of CHC programs, and subsequently publishing the findings from these studies. Thereafter, quarterly meetings should be sufficient to finalize the logic model, redesign monitoring and evaluation indicators and tools, and develop a communication strategy. Towards the end of the first year, I will work with the coalition to organize a conference or in-person meeting where the group can finalize our work.

WASH Research: A side event at the UNC Water and Health conference will serve as a starting point. At the conclusion of this conference, I will work with this coalition to build consensus around a broad vision of what research should be conducted and the need for a consolidated set of social indicators. I propose using a Delphi method with participants at this side event to begin the process of refining appropriate social constructs and begin to prioritize interventions that participants perceive as having the greatest impact on these social constructs.

Communicate the Vision

Implementation Strategies: The Lakou la Santé leadership team will need to communicate the vision to its network of supervisors and facilitators. For the CHC supervisors, this will require a series of team meetings. I recommend the first meeting include leadership of both EEJ and CMHE so the supervisors can see this is a unified effort and not a directive from only one organization or the leadership team in the United States. I want to avoid the perception that these changes are coming from the leadership team in the United States, who the supervisors might perceive as being divorced from the realities on the ground in Haiti. Thereafter, the EEJ leadership team should work with the supervisors to determine the most effective ways of communicating the vision with the facilitators. This communication will happen during regional, bi-monthly meetings with the facilitators and reinforced during refresher trainings and new project trainings.

Monitoring & Evaluation: I, with help from graduate research assistants in San Antonio, will lead the creation of a CHC-specific blog, website or internet-based platform. This platform will serve two purposes. The first is a resource for donors, policy makers and implementing organizations to find the models overarching goals, vision, program logic and evidence. The second is a venue for CHC practitioners to share experiences and lessons learned with implementation and evaluation of CHC programs. Africa AHEAD has an organizational website where information about CHC history, theory and implementation currently resides, but I recommend divorcing this vital resource from any specific organization to further elevate the model and remove any institutional biases that might exist. The coalition should also communicate this new vision and plan at international conferences like the UNC Water and Health conference or the International Water Association conference, and through published papers (editorials or commentaries) in journals like the Bulletin of the World Health Organization or Waterlines.

WASH Research: The first platform for communicating this coalition's vision is the UNC Water and Health conference proceedings. Thereafter, coalition leadership should write opinion pieces for publication in peer reviewed journals like the Lancet or the Bulletin of the World Health Organization, trade journals like Waterlines, and WASH blogs like WASH Advocates. I also recommend writing articles or opinion pieces to be posted on organizational (e.g. Lakou la Santé, Africa AHEAD) or research institute (e.g. Center for Global Safe Water, UNC Water Institute, Eawag institute) websites and social media platforms.

Empower Others to Act

Implementation Strategies: It is important to ensure that the CHC supervisors and facilitators feel they have provided input into both the broad vision as well as the specific ways the team will operationalize the vision. Therefore, during the meetings where the leadership team communicates the proposed vision, I recommend giving everyone the opportunity to react to the proposals and provide input. The supervisors, in particular, should be given an opportunity to co-develop new implementation strategies and monitoring systems. Lakou la Santé leadership should allow for flexibility in application of these recommendations and encourage innovation from the supervisors and facilitators. Finally, Lakou la Santé leadership should explore opportunities to train their network of supervisors and facilitators how to construct low-cost latrines, with the goal of these individuals sharing their knowledge and expertise with their network of CHC members.

Monitoring & Evaluation: The first way I will empower others to act on this vision is to update the CHC program manual to reflect the new social emphasis and disseminate the program logic model. I will also create and distribute a standardized monitoring and evaluation guide as a supplement to the program manual. To further empower others to act on this new vision, I, along with other coalition members, will form a learning collaborative and provide practice-based trainings for all those interested in utilizing our guide. The coalition should target its professional network and offer trainings when and where appropriate for individuals and organizations interested in both the CHC model and inclusion of social capital measures in research or evaluation protocols. Such workshops will help organizations adjust to and utilize changes to program implementation, monitoring and evaluation. Presentations or workshops at international conferences, and lectures on university campuses or at policy meetings can also empower others to act upon this vision.

WASH Research: Other researchers will not act on this vision and my recommendations unless they have the necessary knowledge and the tools. Therefore, I recommend the coalition first organize in person and virtual workshops to disseminate its work and share recommended study methods, indicators and tools. The coalition should also develop and distribute a research and evaluation guide that describes recommended methods, tools and a preliminary set of indicators that others can use in their research and program evaluations.

Short-Term Wins

Implementation Strategies: The Lakou la Santé leadership team, in collaboration with the CHC supervisors, should identify one or two recommendations that are easiest to implement, e.g., those that do not require additional training or resources. From my perspective, these include leveraging social pressure, leveraging a general fear of cholera, and writing proposals to address sanitation self-efficacy. To leverage social pressure, previously trained CHC facilitators could create clusters of 5-10 CHC members who live near each other and ask the members of these clusters to visit each other's homes monthly to observe and report on WASH behaviors. Further, the facilitators and supervisors could remind their CHCs and the wider communities that cholera remains a threat and that the CHC is one way they can ensure the safety of their community. CHC supervisors and managers should collect the same observable measures of behavior change through the clusters as well as qualitative data on the impact of these efforts in order to assess the effect on behavior change and engagement.

I will also encourage the CHC managers and supervisors to experiment with facilitator recruitment strategies within any new programs initiated. They should develop a specific set of requirements about initial members to recruit centered around characteristics that engender trust and strong social networks in the community. These should be communicated to community leaders who would nominate potential candidates. I will then encourage the managers and supervisors to interview the candidates before selecting individuals. I will help Lakou la Santé leadership document the challenges and successes of each of these strategies within six months of implementing the new recruitment strategies. Finally, I will co-write proposals with the other members of the Lakou la Santé leadership team to pilot workshops and implementation of sanitation training or establishing sanitation businesses.

Monitoring & Evaluation: The first short-term win is publication of up to three peer-reviewed manuscripts from this study. I will first publish the literature review of CHC programs and outcomes. To my knowledge, there is no consolidated review of the literature on CHC programs and their impact. My literature review highlights the variability in evaluation methods, tools and outcomes, which reinforces our recommendation for a unified logic model, and monitoring and evaluation toolkit. My second publication will be a summary of my quantitative findings and the third will be a summary of my qualitative findings. Both of these publications will contribute to the growing evidence of CHC programs, highlighting the relationship between CHCs, social capital and WASH outcomes.

Again, these publications will inform the creation of a unified logic model. I will aim to complete these manuscripts and have them ready for submission by the end of 2019.

My second short-term win will be the creation of a unified program logic model and the subsequent monitoring and evaluation guide. I will guide the creation of a logic model within two or three months of the coalition being formed, while the monitoring and evaluation guide could take one year to complete. Thereafter, I will plan to validate the logic model and the new indicators and tools through evaluations of ongoing programs in Haiti, Burkina Faso and Ethiopia (supported by the CMHE) and in Zimbabwe, Rwanda and Uganda (supported by Africa AHEAD). I will plan for these evaluations to include a comparative study of CHCs and a program implemented as part of the national sanitation strategy in Haiti. These studies should be completed within one year of creation of the unified monitoring and evaluation guide, which will be supported by the program logic model.

WASH Research: My first short-term win will be the realization of three publications from this study. The second will be the creation of a database of relevant literature describing WASH interventions and social constructs, like social capital. The database should be housed on an online storage platform to improve accessibility. I, along with two other members of the coalition will be responsible for developing this database, monitoring the literature for new studies, and updating the database. Initially, I will work with this team to write a working paper outlining the key findings from the literature, including descriptions of the interventions, the social constructs measured, the methods and tools used, and the main outcomes reported. This team will also report any updates to the literature via a similar working paper or newsletter to the coalition. In the second year, coalition members should develop and disseminate a set of recommended methods, tools and indicators for use in WASH programs. Within two years, coalition members should test these methods, tools and indicators in studies they design and conduct, resulting in presentations at international conferences and publication in peer reviewed journals. The results should also be shared with USAID, the Gates Foundation and WHO/PAHO, with the goal of influencing wider WASH research strategies.

Consolidate Improvements

Implementation Strategies: The first step to consolidating improvements is to establish purposeful data collection and a process by which the Lakou la Santé leadership team regularly reviews this data. As the CHC supervisors and facilitators implement changes and collect quantitative and qualitative data, they should report this information and

the lessons they have learned during the bi-monthly team meetings in Haiti. I will work with the Haitian leadership team to create a reporting template to document key data and lessons learned, which can then be communicated with the leadership team in Texas via WhatsApp and email. I will then lead the consolidation of learning from these ongoing discussions during the leadership team's monthly phone calls. Every quarter, I will document the main lessons and challenges, which I will then encourage the Haitian leadership team to communicate back to the supervisors and facilitators, along with any new action plans we create. It is essential to document the success of all changes to implementation, as these practices will need to be integrated into a revised Haiti-specific CHC training manual.

Monitoring & Evaluation: In years two and three, I will work with the coalition to consolidate the feedback and lessons learned from their research, and any other studies conducted by organizations implementing CHCs as shared on the CHC program blog or website. I will work with a graduate student to update the monitoring and evaluation manual and I will encourage coalition members to publish results of any studies that use the standard indicators and tools. I will encourage coalition members to first publish all information, manuscripts and editorials on the CHC program blog, but these documents should also be submitted for peer review in relevant journals. Finally, I will encourage members of the coalition to present their work at international conferences, either as individual presentations or collectively as panels or workshops.

WASH Research: Throughout year's one through three, the coalition should continue meeting quarterly to review the work completed, identify key lessons learned and any observable trends. At this stage, the coalition should seek to share their literature review and findings with the broader WASH community via white papers posted online and a literature review published in a peer reviewed journal. They should also refine the indicator list, evaluation methods and tools, and organize in a comprehensive social indicator guide for inclusion in WASH programs.

Institutionalize Change

Implementation Strategies: The key to institutionalizing change in implementation strategies in Haiti is to update the CHC training manual to reflect specific implementation strategies, including when each strategy should be used during the program. As currently written, the training manual only provides detailed instructions on how to lead the weekly health promotion sessions. However, I feel that the manual should also include detailed instructions on how to select facilitators, mobilize communities, recruit members strategically, and communicate in ways that encourage

participation. Once I update the manual (in year two or three), all previously trained and active supervisors and facilitators should receive a new copy and will be required to participate in a two-day workshop to review the changes.

Monitoring & Evaluation: The first step in institutionalizing these changes is to update the CHC training manual, which will be informed by changes made to the Haitian manual. The manual should reflect the CHCs emphasis on social capital, WASH behavior change, and include the logic model. I will supplement the manual with the standardized monitoring and evaluation guide. I understand that each country and program will have context specific indicators, but this guide will ensure that all programs measure the same general indicators using standardized tools and methods (depending upon the scope and scale of the program). The coalition should distribute electronic copies of both manuals to all organizations and practitioners using the CHC model, who can translate and adapt the manuals for their specific country's programs. Finally, the coalition should engage in ongoing quality improvement and country contextualization through virtual and in-person meetings at least twice per year.

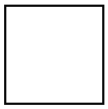
WASH Research: Institutionalization of changes to WASH research strategy will be challenging, as there are many factors that influence decisions about funding WASH research and programs. However, the coalition can influence these decisions through the above-mentioned publications and advocacy with donors like USAID and the Gates foundation, as well as policy makers like the WHO. A key focus should be the publication and promotion of the WASH-specific social indicators.

APPENDIX 1: COMMUNITY HEALTH CLUB MEMBERSHIP CARD

Visites Cliniques		
Date	Clinique	Raison

SCHOOL OF MEDICINE
UT HEALTH SCIENCE CENTER
THE CENTER FOR MEDICAL HUMANITIES & ETHICS

CARTE MEMBRE DU CLUB DE SANTE COMMUNAUTAIRE



Nom du Membre

.....

Club de Santé Communautaire

.....

Facilitateur/Trice

.....

Communauté

.....

Date de commencement

.....

Date du Gradué

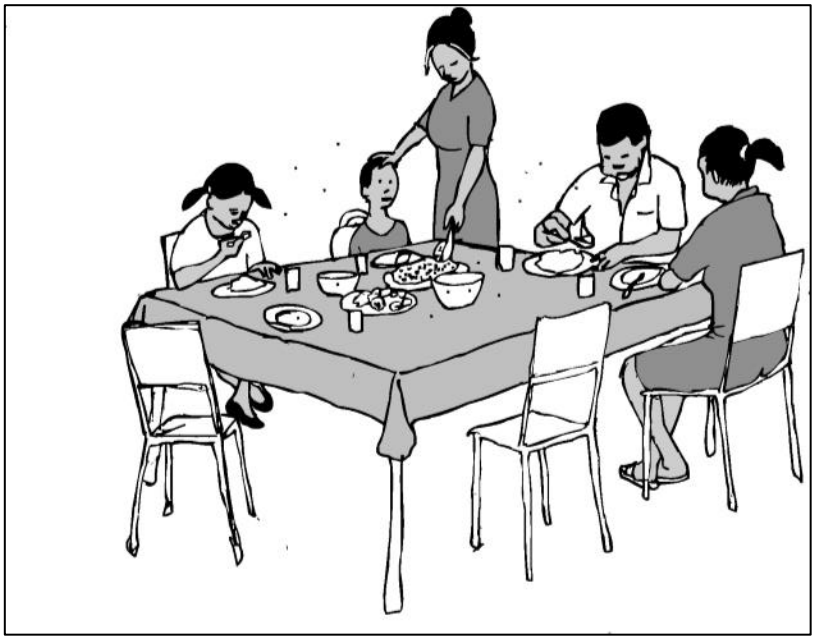
.....

NO	THÈME	DATE	SIGNATURE	PRATIQUE RECOMMANDÉE	COMPLÉTER
1	Théorie des germes			1. Amener un ami à la prochaine réunion du Club	
2	Hygiène personnel			2. Laver les vêtements, draps, couvertures	
3	Maladie de la peau			3. Pas de maladie de la peau à la maison	
4	Transmission de la diarrhée			4. Chants sur les 5 F	
5	Choléra			5. Chant sur le choléra	
6	Réhydratation orale			6. Démonstration de la préparation de la solution à la maison	
7	Diarrhée à travers les doigts			7. Installation d'un lavabo	
8	Lavage des mains avec du savon			8. Disposition du savon chez soi	
9	Quand doit-on se laver les mains			9. Utilisation du lavabo	
10	Diarrhée à travers la nourriture			10. Préparer les aliments de manières propres	
11	Diarrhée à travers l'eau de boisson			11. Protéger ton eau potable	
12	Source d'eau			12. Utiliser les sources d'eau propres.	
13	Protection de l'eau			13. Utilise un recipient à manche pour prendre de l'eau	
14	Eau potable			14. Un gobelet pour chaque membre de la famille	
15	Diarrhée à travers les mouches			15. Pas de fatras aux alentours	
16	Pratique de défécation			16. Nettoyer les latrines	
17	Option d'assainissement			17. Couvrir les défécations à l'air libres	
18	Les parasites			18. Couper et nettoyer les ongles	
19	Vers			19. Pas de parasite à la maison	
20	Utilisation de l'eau			20. Pas de flatte d'eau autour de la maison	
21	Utilisation d'assainissement			21. Agenda pour nettoyer les latrines	
22	Utilisations des déchets solides			22. Sites de décharges, panier pour les fatras	
23	Malaria/Dengue			23. Une moustiquaire pour chaque lit.	

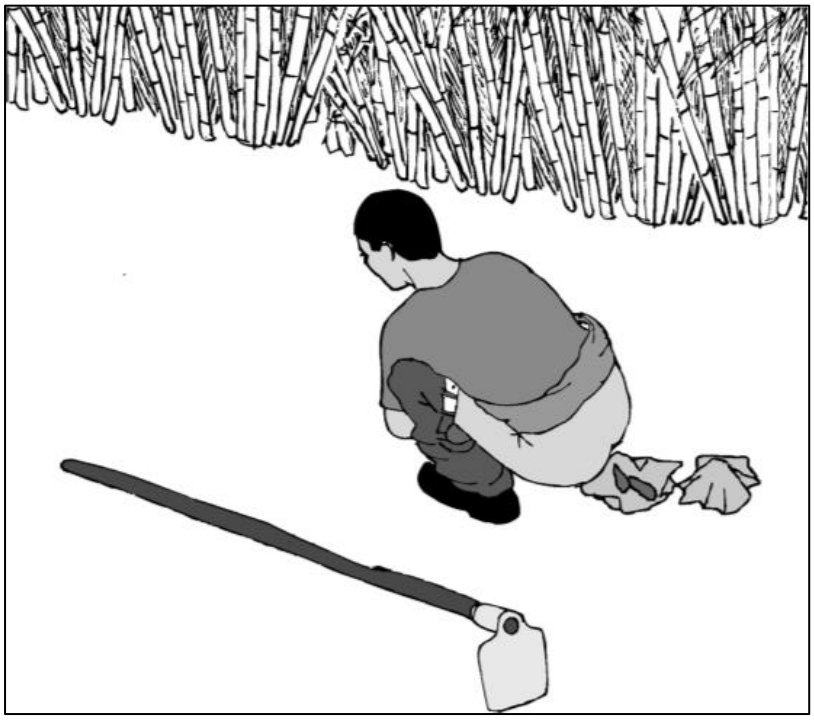
APPENDIX 2: SAMPLE IMAGES FROM THE COMMUNITY HEALTH CLUB TOOLKIT

Below is a sample of four images from the CHC toolkit, the curriculum used during the 23 weeks of participatory health education. These images are used with a variety of fun, participatory activities described in Appendix 3.

Boy washing hands at tap, without soap



Family eating meal together with lots of flies



Man openly defecating, but burying feces (cat sanitation)

Women collecting water from water tap outside of home

APPENDIX 3: DESCRIPTION OF CHC PARTICIPATORY ACTIVITIES

The following section is lifted directly from the CHC Training Manual for Workshop Participants, section 4.1: Introduction: Participatory Activities (citation).

WHAT IS THE PARTICIPATORY APPROACH?

Instead of 'teaching' in the old style, whereby an expert delivers knowledge to the pupil who has to listen and learn without making any comments or decisions themselves, the 'participatory approach' encourages people to think for themselves. Participatory activities are used to enable people to brainstorm and come up with their own ideas.

Participatory Health and Hygiene Education (PHHE) is the name given to this 'process' of learning focused particularly on Water, Sanitation and Health Promotion. A special 'Toolkit' of Visual Aids has been developed that should be used with the following well known participatory activities.

PHHE ACTIVITIES:

1. ROLE PLAYING:

The card set 'Community Members' is given out and each participant with a card is asked to imagine that they are the person illustrated on the card. The role play can focus on a range of issues, such as the common illnesses, practices, behaviors and attitudes of each individual community member. This activity is most commonly used with the Nurse Ana Role Play, but it can also be used with any of the topics to stimulate conversation about the different risk and preventative practices, behaviors and attitudes of community members for each topic (e.g. water storage, malaria/dengue, personal hygiene, etc.).

2. MAKING STORIES:

There are three main ways to use a story to get participants to identify problems and solutions:

- *Pre-Arranged Story:* a set of cards make a story, they should be given out so participants arrange them to make the story.
- *Open Ended Story:* Each person takes one of the cards and explains what they see and what will happen next.
- *SWAG (Story with a Gap):* Each person takes two cards to show 'Before' and 'After' and explains what happened in between the two cards, so analyzing how to get from one situation to

another.

- *Make a Full Story:* Provide a large number of mixed cards and each person selects a few cards to show a problem and how it was solved.

3. THREE PILE SORTING / GROUPING:

A variety of picture cards are given out, depicting a range of different hygiene practices or situations typical of the local area. Each participant must hold up a picture and decide if the practice is 'Good' (Safe), 'Bad' (Unsafe), or 'Medium' (Unsure/Average) in terms of health risk. Either put the cards into three piles or people with their cards form three groups, and discuss reasons for the grouping. The next stage is to rank them from best to worst in a Priority Line Up.

4. PRIORITY LINE UP:

Once three piles/groups are made, participants then organize the pictures in terms of priority (most preferred options to least preferred option OR easiest option to implement to most difficult). When each of the cards are prioritized and a discussion has followed, this activity then can be used to evaluate current practices, with each participant first standing behind the picture of their current practice and then standing behind their desired practice.

5. STAND UP, OWN UP

Cards showing good practices are given out and each participant comes to the front to explain the card. Then everyone stands up. The facilitator shows one card at a time, and anyone who is not practicing what is shown on the card must sit down. Those that are left standing after all the cards have been shown are the 'winners' and they are praised as being a good example and what all CHC members must aspire to become.

6. SANITATION LADDER OR WATER LADDER

Often this shows a range of technical options such as water sources or types of sanitation. The pictures will depict the least safe or feasible technical option to the most favored solution. This enables a discussion to take place focused on a consensus achieved through brainstorming as to the advantages and disadvantages of each option.

7. BLOCKING THE ROUTE:

This is the most useful activity for enabling a group to see how to prevent a certain disease. The transmission

'ROUTE' of the disease is represented in stages on different cards, which are given out. Each person holds up one card and the group arranges the correct sequence of 'transmission'. Then the other cards that show how to prevent the disease are given out. Each person comes forward and shows which stage of the transmission can be blocked by the practice shown on their card. They stand in front of the transmission card that they could block. When all cards have been shown, a discussion takes place as to the most effective interventions that can be done to 'block the route' of transmission.

8. PREVENTION AND CURE:

As a follow-on to Blocking the Route activity, two participants are each given a card, one with a sick person and one with a healthy person, while all the 'transmission cards' and 'blocking cards' are given out to the audience. The 'sick person' begins by describing the symptoms and transmission of the disease. At the same time, the people in the audience with the transmission cards come to the front as their card is mentioned, holding up their pictures. The 'healthy person' then tells how they prevented the disease, or blocked each route. As each method of blocking the route is mentioned, the participant in the audience with that card comes to the front and blocks the appropriate 'transmission card' or route. The sick person then describes how they can be cured. Alternatively, after the 'sick person' describes the transmission of the disease, those in the audience with the 'blocking cards' can come up one at a time before the 'healthy person' describes how to prevent the disease, showing which transmission card is blocked by their own picture. The 'healthy person' then describes the process to the audience.

APPENDIX 4: EVALUATION STUDY SAMPLE BY COMMUNITY

Commune	Locality	Intervention (CHC Member)		Intervention (Non-Member)		Intervention (Missing)	Intervention Total		Comparison	
		Baseline n (%)	Final n (%)	Baseline n (%)	Final n (%)	Baseline n (%)	Baseline n (%)	Final n (%)	Baseline n (%)	Final n (%)
Mirebalais	*Kouret*	18 (13.7)	18 (13.8)	-	-	7 (16.3)	25 (13.2)	18 (12.4)	-	-
	Belanger	11 (8.4)	11 (8.5)	1 (6.7)	1 (6.7)	8 (18.6)	20 (10.6)	12 (8.3)	-	-
	Duvye	25 (19.1)	25 (19.2)	3 (20)	3 (20)	2 (4.7)	30 (15.9)	28 (19.3)	-	-
	Bayas	3 (2.3)	2 (1.5)	-	-	3 (7.0)	6 (3.2)	2 (1.4)	-	-
	Desvarieux	9 (6.9)	9 (6.9)	1 (6.7)	1 (6.7)	8 (18.6)	18 (9.5)	10 (6.9)	-	-
	Gilbert	24 (18.3)	24 (18.5)	4 (26.7)	4 (26.7)	7 (16.3)	35 (18.5)	28 (19.3)	-	-
	Boyer	33 (25.2)	33 (25.4)	5 (33.3)	5 (33.3)	4 (9.3)	42 (22.2)	38 (26.2)	-	-
	Koup Goj	8 (6.1)	8 (6.2)	1 (6.7)	1 (6.7)	4 (9.3)	13 (6.9)	9 (6.2)	-	-
	Chambrun	-	-	-	-	-	-	-	49 (48.5)	36 (51.4)
	Ravine Citron	-	-	-	-	-	-	-	52 (51.5)	34 (48.6)
	Sub-Total	***131 (72.4)***	***131 (72.4)***	***15 (14.7)***	***15 (14.7)***	***43 (44.3)***	***189 (49.7)***	***146 (51.4)***	***101 (31.1)***	***71 (30.0)***
Lascahobas	*Los Pinos*	12 (31.6)	12 (31.6)	1 (1.7)	1 (1.7)	6 (18.2)	19 (14.6)	13 (13.3)	-	-
	Verdun	8 (21.1)	8 (21.1)	-	-	4 (12.1)	12 (9.2)	8 (8.2)	-	-
	Juampas	3 (7.9)	3 (7.9)	3 (5.1)	3 (5.1)	4 (12.1)	10 (7.7)	6 (6.1)	-	-
	Quimpe	8 (21.1)	8 (21.1)	8 (13.6)	8 (13.6)	6 (18.2)	22 (16.9)	17 (17.3)	-	-
	Madam Marc	7 (18.4)	7 (18.4)	25 (42.4)	25 (42.4)	10 (30.3)	42 (32.3)	32 (32.7)	-	-
	Cite Fimen	-	-	22 (37.3)	22 (37.3)	3 (9.1)	25 (19.2)	22 (22.4)	-	-
	Bois Pin	-	-	-	-	-	-	-	52 (50)	35 (46.8)
	La Colline	-	-	-	-	-	-	-	52 (50)	41 (53.2)
	Sub-Total	***38 (21.0)***	***38 (21.0)***	***59 (57.8)***	***59 (57.8)***	***33 (34)***	***130 (34.2)***	***98 (34.5)***	***104 (32.0)***	***77 (32.5)***
Boucan Carré	*Dufyai*	10 (100)	10 (100)	5 (100)	5 (100)	13 (100)	28 (100)	15 (100)	-	-
	Te Blanche	-	-	-	-	-	-	-	60 (100)	42 (100)
	Sub-Total	***10 (5.5)***	***10 (5.5)***	***5 (4.9)***	***5 (4.9)***	***13 (13.4)***	***28 (7.4)***	***15 (5.3)***	***60 (18.5)***	***42 (17.7)***
Belladère	*Louba*	2 (100)	2 (100)	23 (100)	23 (100)	8 (100)	33 (100)	25 (100)	-	-
	Fleuri	-	-	-	-	-	-	-	60 (100)	47 (100)
	Sub-Total	***2 (1.1)***	***2 (1.1)***	***23 (22.5)***	***23 (22.5)***	***8 (8.2)***	***33 (8.7)***	***25 (8.8)***	***60 (18.5)***	***47 (19.8)***
Sample Totals		**181 (100)**	**181 (100)**	**102 (100)**	**102 (100)**	**97 (100)**	**380 (100)**	**284 (100)**	**325 (100)**	**237 (100)**

APPENDIX 5: DATA DICTIONARY

Variable	Variable Description	Variable Type	Responses
WASH Behaviors			
Environment			
Garbage	Is there any visible garbage within 5 paces of the yard (observation)	Categorical	1. Yes, w/in 5 paces 2. Yes, spread around the yard 3. No
Animal Feces	Animal poop in the yard (observation)	Categorical	1. Yes 2. No 3. Cannot see
Standing Water	Any standing water within 5 paces of yard (observation)	Categorical	1. Yes 2. No 3. Cannot see
Garbage Container	Is there a container/place to put the garbage (observation)	Categorical	1. Yes 2. No 3. Cannot see
Environment Score	Cumulative score of environment indicators	Continuous	0-4
Kitchen			
Clean Kitchen Area	Is the place to prepare food clean (observation)	Categorical	1. Yes 2. No 3. Cannot see
Clean Pots	Seen dirty pots and containers (observation)	Categorical	1. Yes 2. No 3. Cannot see
Flies	Number of flies where prepare food (observation)	Categorical	1. Yes, more than 10 2. Yes, less than 10 3. No 4. Cannot see
Covered Food	Is all prepared food covered (observation)	Categorical	1. Yes 2. No 3. Cannot see
Kitchen Score	Cumulative score of kitchen indicators	Continuous	0-4
Hand Washing			
How wash hands	Pour water or share bowl	Categorical	1. Pour water 2. Share bowl 3. Cannot see
Soap	Is soap present (Observation)	Categorical	1. Yes 2. No 3. Cannot see
Hand Washing Score	Cumulative score of hand washing indicators	Continuous	0-2
Drinking Water			
Store water	Store water in the house	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Cover water	How well covered is the storage container (observation)	Categorical	1. Yes, all are well covered 2. No, not well covered 3. No, no cover at all 4. Cannot see

Drinking water ladle	Do they have a ladle or spoon for taking water (observation)	Categorical	1. Yes 2. No 3. Does not need 4. Cannot see
Drinking Water score	Cumulative score of drinking water indicators	Continuous	0-2
Sanitation			
Latrine type	Where do you go to the bathroom (type of latrine)	Categorical	1. Toilet (flush) 2. Latrine with ventilation 3. Latrine w/out ventilation 4. Compost latrine 5. Hole 6. Plastic bag 7. Open defecation 8. Don't know 9. No response
Clean latrine	Is the latrine clean- free of garbage, feces and urine on the floor or seat (observation)	Categorical	1. Yes 2. No 3. Cannot see
Sealed latrine	Is the latrine sealed – hole is covered & no access to vault (observation)	Categorical	1. Yes 2. No 3. Cannot see
Fecal burial	Do you cover your feces (if open defecate)	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Sanitation Score	Cumulative score of sanitation indicators	Continuous	0-2
Hygiene Index (see table below)	Composite score of Environment, Kitchen, Hand Washing, Drinking Water and Sanitation	Continuous	0-14
Drinking Water Source	What is the households primary drinking water source	Categorical	1. Tap 2. Bag water 3. Water kiosk/vendor 4. Rainwater 5. River, lake, stream or other open source 6. Other source
Water treatment	Do you treat your drinking water at home	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
WASH Knowledge			
Diarrhea Prevention Score	Name five ways that diarrhea can be prevented	Continuous	0-5
Skin Disease Prevention Score	Name five ways that skin diseases can be prevented	Continuous	0-5
Hand Washing Prevention Score	Name five times it is important to wash hands	Continuous	0-5
Oral Rehydration Solution Score	Describe the ingredients in a home-made oral rehydration solution	Continuous	0-3

WASH Knowledge Score	Composite score of diarrhea, skin disease, hand washing and ORS scores	Continuous	0-18
WASH Attitudes			
Water treatment attitudes			
Own water treatment attitude	How important is it for you to treat your drinking water	Ordinal	1. Important 2. More or less important 3. Not important 4. Don't know 5. No response
Family water treatment attitudes	How important is it for your family to treat their drinking water	Ordinal	1. Important 2. More or less important 3. Not important 4. Don't know 5. No response
Neighbor water treatment attitudes	How important is it for your neighbors to treat their drinking water	Ordinal	1. Important 2. More or less important 3. Not important 4. Don't know 5. No response
Latrine use attitudes			
Own latrine use attitude	How important is it for you to use a latrine when you defecate	Ordinal	1. Important 2. More or less important 3. Not important 4. Don't know 5. No response
Family latrine use attitude	How important is it for your family to use a latrine when they defecate	Ordinal	1. Important 2. More or less important 3. Not important 4. Don't know 5. No response
Neighbor latrine use attitude	How important is it for your neighbors to use a latrine when they defecate	Ordinal	1. Important 2. More or less important 3. Not important 4. Don't know 5. No response
Hand washing attitudes			
Own hand washing attitude	How important is it for you to wash your hands with soap during the day	Ordinal	1. Important 2. More or less important 3. Not important 4. Don't know 5. No response
Family hand washing attitude	How important is it for your family to wash their hands with soap during the day	Ordinal	1. Important 2. More or less important 3. Not important 4. Don't know 5. No response
Neighbor hand washing attitude	How important is it for your neighbors to wash their hands with soap during the day	Ordinal	1. Important 2. More or less important 3. Not important 4. Don't know 5. No response
Social Capital			
Group Membership			

Number of groups	Cumulative number of groups a household is an active member of	Continuous	0-∞
Group years	Number of years involved with important group	Continuous	0-∞
Group participate	Number of times participated in group in past year	Continuous	0-∞
Trust & Solidarity			
General trust	In general, do you trust most people	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
General help	Most people would help me if I needed it	Ordinal	1. Agree 2. Disagree 3. Don't know 4. No response
Community trust	Most people in this community can be trusted	Ordinal	1. Agree 2. Disagree 3. Don't know 4. No response
Community loans	Most people in this community would lend money without problems	Ordinal	1. Agree 2. Disagree 3. Don't know 4. No response
Trust family	How much trust do you have in your family	Ordinal	1. A lot of trust 2. Not much trust 3. No trust 4. Don't know 5. No response
Trust community	How much trust do you have in people in your community	Ordinal	1. A lot of trust 2. Not much trust 3. No trust 4. Don't know 5. No response
Trust local leaders	How much trust do you have in your local leaders	Ordinal	1. A lot of trust 2. Not much trust 3. No trust 4. Don't know 5. No response
Trust outside community	How much trust do you have in people that live outside this community	Ordinal	1. A lot of trust 2. Not much trust 3. No trust 4. Don't know 5. No response
Give time to project	If a project did not provide you a direct benefit, would you contribute your time	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Give money to project	If a project did not provide you a direct benefit, would you contribute your money	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Theft	Can people steal things from your home if you are not there	Categorical	1. Yes 2. No 3. Don't Know

			4. No Response
Pay local leaders	Do you ever have to pay local leaders to get things done	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Collective action & Participation			
Participate in communal activity	Has anyone in this household participated in any communal activities in the past 12 months	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
How often participate in communal activity	How many times did people participate in the past 12 months	Continuous	0-∞
Criticize if not participate	Will you be criticized if you do not participate in communal activities	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Own house help	If your house was damaged, would people in this community help you	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Neighbor house help	If your neighbor's house was damaged, would you help	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
General communal help	Do people in this community generally help each other with issues or challenges	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Reciprocity	If you help people in this community, do they help you in return	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Sick help	If you were sick, would your neighbors help you	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Child sick help	If you child was sick and you needed money, would people in this community help	Categorical	1. Yes 2. No 3. Don't Know 4. No Response
Demographics			
Club Member	Registered member of a community health club	Categorical	1. Yes 2. No
Gender	Gender	Categorical	1. Female 2. Male
Age	Age of respondent	Continuous	18-100
Education	Highest level of schooling completed	Categorical	1. Primary 2. Secondary (7em -9em AF) 3. Secondary (3em to Reto) 4. Secondary (Filo) 5. Faculty 6. Analfabet 7. Don't Know 8. No response

Marital Status	Marital status	Categorical	1. Single 2. Married 3. Civil union 4. divorced 5. widowed 6. Don't know 7. No response
Time in house	Number of years live in house	Continuous	0-∞
Home ownership	Does the family/respondent own the house they live in	Categorical	1. Yes, home owner 2. No, renting 3. Neither own nor rent 4. don't know 5. No response
Household size	Number of people living in the household	Continuous	0-∞
Household income	How much money does the household make in one month	Categorical	1. <2,000 gourdes 2. 2,000-5,000 gourdes 3. 5,000-10,000 gourdes 4. 10,000-15, 000 gourdes 5. >15,000 gourdes 6. Don't know 7. No response 8. N/A
Small spending	What is the smallest daily expenditure that you would make	Continuous	0-∞
Large spending	What is the largest daily expenditure that you would make	Continuous	0-∞
Number of houses	Number of houses in the compound	Continuous	0-∞
Roof	What is the majority of the roofing material	Categorical	1. Cement 2. Straw/Thatch 3. Plastic 4. Wood 5. Sheet metal/Zinc
Walls	What is the majority of the wall material	Categorical	1. Block 2. Wood 3. Plastic 4. Cement 5. Tif (no translation yet) 6. Sheet metal/Zinc
Floor	What is the majority of the floor material	Categorical	1. Cement 2. Wood 3. Earth 4. Ceramic/tile

APPENDIX 6: HYGIENE INDEX

Dimension	Indicator	Haiti Survey	Points
Environment	***No, Garbage***	Garbage	1
	No, Animal Feces	Animal Feces	1
	No, Standing Water	Standing Water	1
	Yes, Garbage Pit	Garbage Container	1
Kitchen Hygiene	***Yes, Clean Surfaces***	Kitchen Clean	1
	Yes, Clean Dishes	Clean Pots	1
	No, Flies	Flies	1
	Yes, Food Covered	Covered Food	1
Hand Washing	***Pour to Waste HW Method***	How Wash Hands	1
	Yes, Soap	Soap	1
Drinking Water	***Yes, Water Covered***	Store Water (if yes, then) & Cover Store	1
	Yes, Ladle or Spoon	Drinking Water Ladle	1
Sanitation/Defecation	***No, Open Defecation (use safe sanitation)***	Latrine Type	1
	Yes, Access to Latrine		
	Yes, Clean Latrine	Clean Latrine	0.5
	Yes, Sealed Latrine	Sealed Latrine	0.5
	OR		
	Yes, Fecal Burial	Fecal Burial	1
Hygiene Index = Sum Score			**Maximum of 14 points**

NOTE: in the data dictionary, all variables above are not yet dichotomous. We made them dichotomous to facilitate our analyses.

APPENDIX 7: CATPCA RESULTS

	Factor 1: Group Membership & Participation	Factor 2: Social Support	Factor 3: Trust	Factor 4: Social Solidarity
Cronbach Alpha	0.792	0.690	0.544	0.478
Eigenvalues	4.010	2.885	2.064	1.827
Factor Loadings				
Social Capital Variables				
Group Membership	**1.015**	-	-	-
Membership Years	**1.015**	-	-	-
Group Participation	**1.015**	-	-	-
Household Participation	**0.551**	-	-	-
Neighbors Repair Your House	-	**0.498**	-	-
Help Neighbors Repair House	-	**0.605**	-	-
Help Neighbors Generally	-	**0.722**	-	-
Reciprocity	-	**0.587**	-	-
Sick Help	-	**0.864**	-	-
Sick Child Money	-	**0.869**	-	-
Trust Family	-	-	**0.509**	-
Trust Community	-	-	**0.784**	-
Trust Leaders	-	-	**0.726**	-
Trust Outsiders	-	-	**0.713**	-
Project Time	-	-	-	**0.982**
Project Money	-	-	-	**0.974**
Pay Leaders	-	-	-	-
Theft	-	-	-	-
Criticize if No Participate	-	-	-	-

APPENDIX 8: QUALITATIVE SAMPLING TABLES

	Commune	WASH Knowledge Difference	Rank	Hygiene Index Difference	Rank
Koup Goj	Mirebalais	8.55	1	0.79	4
Verdun	Lascahobas	8.38	2	0.44	
Gilbert	Mirebalais	5.67	3	0.66	5
Juampas	Lascahobas	5.16	4	1.00	3
Quimpe	Lascahobas	4.41		0.12	2
Madam Marc	Lascahobas	4.41		0.38	
Kouret	Mirebalais	-0.50	1	0.22	3
Dufyai	Boucan Carre	1.73	2	0.33	5
Belanger	Mirebalais	2.08	3	0.00	1
Duvye	Mirebalais	2.82	4	0.75	4
Bayas	Mirebalais	0.00		0.50	
Desvarieux	Mirebalais	2.5		1.22	1
Los Pinos	Lascahobas	3.77		1.12	2
Louba	Belladere	2.40		0.26	
Cite Fimen	Lascahobas	2.18		0.36	
Boyer	Mirebalais	3.97		0.66	

Note: Red = low change; Green = high change

Community	Commune	Group	Social Support	Trust	Solidarity	Social Capital Factor Score Interpretation
High Average WASH Knowledge & Hygiene Index Score Change						
Koup Goj	Mirebalais	.759	.534	-.037	.176	High social engagement, but low trust
Juampas	Lascahobas	.757	.491	-.319	.256	High social engagement, but low trust
Gilbert	Mirebalais	-.327	.233	-.268	-.141	All Low
Low Average WASH Knowledge & Hygiene Index Score Change						
Belanger	Mirebalais	.766	.377	.311	.244	High everything
Kouret	Mirebalais	.534	.268	.291	.362	Moderate scores
Dufayi	Boucan Carre	-.084	.441	-.027	.080	Low group and trust, moderate social support
Duvye	Mirebalais	.786	.337	.608	.264	High group membership & trust, moderate social support & solidarity

APPENDIX 9: CLUB MEMBER FOCUS GROUP DISCUSSION GUIDE

Introduction & Consent: was added as a separate script

Introductions and quick icebreaker

Questions:

Thank you for those introductions. It is a pleasure to be with you all today. We appreciate your taking the time to talk with us. I would like to begin by discussing the Community Health Club program. While I have heard about this program, I would like to learn about your thoughts.

1. Please describe the Community Health Club program.
   Probes: *What is the purpose or goal of this program? How did the program work? What did you do as a member of a Community Health Club?*

Social Interactions

Great. Thank you for sharing. I would now like ask you a few questions about how people in your community interact with each other. Based on your observations as a member of this community, describe how you and others from your community have interacted and related to each other since the Club was started. I have three specific questions.

2. What does it mean to have trust or confidence in someone?
   Probes: *how do you define trust? How would you describe the actions or behaviors of someone that you trust?*

Now that we have defined trust and given examples of what it means to have trust or confidence in someone, I would like you to think about the following question:

3. Since the Club started in your community, did you ever observe or feel people in your community showed trust or confidence in each other? If so, in what ways?
   Probes: *Please share examples of how people trust or have confidence in each other in this community. Examples can include letting a neighbor use your favorite bicycle or motorcycle, having confidence that you could leave your home unattended for a week, or believing that what someone tells you is the truth.*

   Probing questions: *How did the Club influence trust or confidence in your community? Do you think the Club helped (increase/decrease) trust amongst Club members? Do you think the Club helped (increase/decrease) trust between Club members and others in the community who did not join the Club? Why did the Club have this effect on trust?*

Great. That was a wonderful. Now I would like you to think about the ways that people support or help each other, and how they come together to make change, in your community.

4. Sometimes we help each other in our day-to-day interactions. Since the Club started, did you ever observe or feel that neighbors were willing to help neighbors with personal issues or do things for each other? If so, please tell me more about how they helped each other or what they did for the other person.
   Probes: *Please share examples of how people support each other in this community. Examples can include watching a neighbor's children while he/she goes to market, helping a sick neighbor clean clothes, or working in each other's field to plant or harvest.*

   Probing questions: *How did the Club influence how people help each other or support each other in your community? Do you think the Club helped (increase/decrease) helping amongst Club members? Do you think the Club helped (increase/decrease) helping between other members of the community who did not join the Club? Why did the Club have this effect on helping people?*

5. Sometimes we come together as groups to help make change in a community. Since the Club started, did you ever observe people in your community working together on a project or working together to achieve a common goal? If so, please tell me more about what you observed.
   Probe: *Please share examples of how people work together to make change in this community. Examples can include working together to build a house or fix a road. If you observed people working together, were they participating in organized groups like the Community Health Club?*

   Probing questions: *How did the Club influence when people working together to solve problems or achieve a common goal in your community? Do you think the Club helped (increase/decrease) working together to solve problems amongst Club members? Do you think the Club helped (increase/decrease) working together to solve problems in other members of the community who did not join the Club? Why did the Club have this effect on working together to solve problems?*

WASH Impact

Thank you everyone. This has been an interesting and engaging discussion. At this point, I would like to change our focus and discuss water, sanitation and hygiene issues in your community. Specifically, I would like to learn more about the impact that the Club program has had on your knowledge and behaviors. I am also interested in learning more about your community's interest and ability to work together to solve problems around water, sanitation and hygiene.

6. Please describe what you have learned about water, sanitation, hygiene since the Club began.
7. Please describe any new water, sanitation and hygiene practices you have started since the Club began.
8. Have the members of your Club worked together to solve or fix a water, sanitation or hygiene issue since the Club began? If yes, please describe the problem and what your Club did to solve the problem.
   Probes: *Have you come together with other members of your community to work on a problem, fix something, or build something specifically related to water, sanitation or hygiene?*

Behavior Over Time Graphs

Great, thank you. For the final part of this discussion, I would you to discuss how specific water, sanitation and hygiene behaviors and collective action have changed since the Club program started. To help me understand how things have or have not changed, I am going to ask you all to draw some lines that show how things have changed over the past year.

Before we begin, I am going to give you instructions and a couple of examples. First, I would like us to draw a line together that shows the availability of mangoes throughout the year. The horizontal line will be time, starting from January on the left through to December on the right. The vertical line will be the number of mangoes available *(Draw an example of the x- and y-axis, which will be used to draw one line for the entire group)*. We are now going to draw a line that shows how the number of mangoes increases or decreases throughout the year. So in January, do we have a lot of mangoes, some mangoes or no mangoes? How does this change as we move through the year? At what time of year do we have many mangoes? At what time of year are there no mangoes?

Great. Now that we have this line, I want to ask you a few questions. Why are there more mangoes at this time than at others? What are the specific reasons we have more mangoes here and less mangoes here? I am going to write those reasons on the line so that we can better understand the things that affect the availability of mangoes.

Ok. Let us look at another, slightly more complicated example. Think about how tired you are during the day. I would like you to draw a graph that shows how tired you are throughout the day, from morning until evening. Again, our horizontal line will be time; starting from when you wake up in the morning until you go to bed at night. The vertical line will be your level of tiredness, from not at all tired on the bottom to very tired or unable to stay awake on the top. So, how tired are you when you wake up? How does this change throughout the day? Does it go up or down at different points in time? What about at mid-morning (9 or

10am)? Mid-day? Afternoon? Early evening? Night? Before you go to sleep? *After people have drawn a graph, have them quickly explain their graph.* Why are you more or less tired at different times of the day?

Does everyone understand how to make these lines and think they can do it themselves? Great. Now I am going to have everyone draw his or her own lines. In total, we are going to draw three lines, but we will draw them one at a time. Let us begin with WASH behaviors. I would like each of you to draw a line showing how WASH behaviors have changed since the Club program began. *Reflect back on what the participants have already said about WASH behaviors and use no more than two (2) specific examples.* To make this easier, we will focus on two behaviors that this group identified as important or meaningful. When I asked about the new behaviors or practices that you have adopted because of the Club program, you mentioned (*hand washing with soap*) and (*defecation practices*). Can we use those behaviors for this activity? Great. Let us graph one behavior at a time, starting with (*hand washing*).

9. Please draw a line that shows how often you (*washed your hands with soap at key times (before eating/cooking, after defecating, etc) during the day*) before the Club program started? How did this change once the Club program started? What about as the Club program continued? What about once the Club program ended?

   After you draw your line, please take a moment to consider why you think the change (increase or decrease) happened. What factors, issues, or events contributed to that change? Then I would like you to make notes that explain what factors, issues, or events led to that change. *Give the participants at least 5 minutes (no more than 7 minutes) to draw their line and annotate their line.*

   Now I would like you to describe your line. Who would like to go first? *As each person describes their line, ask the following probing questions for each (discussion should be no longer than 10 minutes):*

   Probes: Why did this change (increase/decrease)? What specific events or factors led to each change? What do others think about this line and the changes it shows? What specific Club activities contributed to this change in hand washing practices? Why? How did the Club influence the hand washing practices of those that did not join the Club? Does your line represent the hand washing practices of people who are not Club members? Why are non-members different/the same?

   If the discussants did not mention any social capital factors like trust, social support or social pressure, then ask the following probes: I would also like to know how the social issues we talked about at the beginning of our discussion contributed to the changes you noted. Did trust, group participation, social support, social pressure or other social issues influence these changes? If so, please describe how.

10. Now let us draw a line showing how often you practiced safe defecation practices (used a toilet, latrine, or buried your feces). Before the Club program started, how often did you practice safe defecation practices during the day? How did this change once the Club program started? What about as the Club program continued? What about once the Club program ended?

    After you draw your line, please take a moment to consider why you think the change (increase or decrease) happened. What factors, issues, or events contributed to that change? Then I would like you to make notes that explain what factors, issues, or events led to that change. *Give the participants at least 5 minutes (no more than 7 minutes) to draw their line and annotate their line.*

    Now I would like you to describe your line. Who would like to go first? *As each person describes their line, ask the following probing questions for each (discussion should be no longer than 10 minutes):*

    Probes: Why did this change (increase/decrease)? What specific events or factors led to each change? What do others think about this line and the changes it shows? What specific Club activities contributed to this change in defecation practices? Why? How did the Club influence the

defecation practices of those that did not join the Club? Does your line represent the defecation practices of people who are not Club members? Why are non-members different/the same?

If the discussants did not mention any social capital factors like trust, social support or social pressure, then ask the following probes: I would also like to know how the social issues we talked about at the beginning of our discussion contributed to the changes you noted. Did trust, group participation, social support, social pressure or other social issues influence these changes? If so, please describe how.

11. Wonderful! We have one more line to draw and discussion. Our last line will show how often you have joined others in your community to work on a common project or solve a collective goal. *Reflect back on what they already told you about WASH collective action and use specific examples from what they said*. When the program started, how often did you come together as a community to work on problems? How did this change once the Club program started? What about as the Club program continued? What about once the Club program ended?

    After you draw your line, please take a moment to consider why you think the change (increase or decrease) happened. What factors, issues, or events contributed to that change? Then I would like you to make notes that explain what factors, issues, or events led to that change. *Give the participants at least 5 minutes (no more than 7 minutes) to draw their line and annotate their line.*

    Now I would like you to describe your line. Who would like to go first? *As each person describes their line, ask the following probing questions for each (discussion should be no longer than 10 minutes):*

    Probes: Why did this change (increase/decrease)? What specific events or factors led to each change? do others think about this line and the changes it shows? What specific Club activities contributed to this change in working together to (insert the problem they described)? Why? How did the Club influence those that did not join the Club? Does your line represent people who are not Club members? Why are non-members different/the same?

    If the discussants did not mention any social capital factors like trust, social support or social pressure, then ask the following probes: I would also like to know how the social issues we talked about at the beginning of our discussion contributed to the changes you noted. Did trust, group participation, social support, social pressure or other social issues influence these changes? If so, please describe how.

Conclusion

Great work everyone. Is there anything else you would like to tell me about the CHC intervention or the social resources here in your community?

At this point, I do not have any more questions or activities for you. However, I do want to give you an opportunity to ask me questions. I am only able to answer questions about this discussion or the broader study. Do you have any questions?

Well, thank you once again for your time. We do appreciate your sharing your morning/afternoon with us.

APPENDIX 10: CLUB FACILITATOR FOCUS GROUP DISCUSSION GUIDE

Introduction & Consent: was added as a separate script

Introductions and quick icebreaker

Questions:

Thank you for those introductions. It is a pleasure to be with you all today. We appreciate your taking the time to talk with us. I would like to begin by discussing the Community Health Club program. While I have heard about this program, I would like to learn about your thoughts.

1. Please describe the Community Health Club program.
   Probes: *What is the purpose or goal of this program? How did the program work? What did you do as a facilitator of a Community Health Club? What did the members do?*

Social Interactions

Great. Thank you for sharing. I would now like ask you a few questions about how people in your community interact with each other. Based on your observations as a Club facilitator, describe how you and others from your communities have interacted and related to each other since the Club was started. I have three specific questions.

2. What does it mean to have trust or confidence in someone?
   Probes: *how do you define trust? How would you describe the actions or behaviors of someone that you trust?*

Now that we have defined trust and given examples of what it means to have trust or confidence in someone, I would like you to think about the following question:

3. Since the Club started in your community, did you ever observe or feel people in your community showed trust or confidence in each other? If so, in what ways?
   Probes: *Please share examples of how people trust or have confidence in each other in this community. Examples can include letting a neighbor use your favorite bicycle or motorcycle, having confidence that you could leave your home unattended for a week, or believing that what someone tells you is the truth.*

   Probing questions: *How did the Club influence trust or confidence in your community? Do you think the Club helped (increase/decrease) trust amongst Club members? Do you think the Club helped (increase/decrease) trust between Club members and others in the community who did not join the Club? Why did the Club have this effect on trust?*

Great. That was a wonderful. Now I would like you to think about the ways that people support or help each other, and how they come together to make change, in your communities.

4. Sometimes we help each other in our day-to-day interactions. Since the Club started, did you ever observe or feel that neighbors were willing to help neighbors with personal issues or do things for each other in your community? If so, please tell me more about how they helped each other or what they did for the other person.
   Probes: *Please share examples of how people support each other in your community. Examples can include watching a neighbor's children while he/she goes to market, helping a sick neighbor clean clothes, or working in each other's field to plant or harvest.*

   Probing questions: *How did the Club influence how people help each other or support each other in your community? Do you think the Club helped (increase/decrease) helping amongst Club members? Do you think the Club helped (increase/decrease) helping between other members of the community who did not*

join the Club? Why did the Club have this effect on helping people?

5. Sometimes we come together as groups to help make change in a community. Since the Club started, did you ever observe people in your community working together on a project or working together to achieve a common goal? If so, please tell me more about what you observed.
   Probe: *Please share examples of how people work together to make change in this community. Examples can include working together to build a house or fix a road. If you observed people working together, were they participating in organized groups like the Community Health Club?*

   Probing questions: *How did the Club influence when people working together to solve problems or achieve a common goal in your community? Do you think the Club helped (increase/decrease) working together to solve problems amongst Club members? Do you think the Club helped (increase/decrease) working together to solve problems in other members of the community who did not join the Club? Why did the Club have this effect on working together to solve problems?*

WASH Impact

Thank you everyone. This has been an interesting and engaging discussion. At this point, I would like to change our focus and discuss water, sanitation and hygiene issues in your communities. Specifically, I would like to learn more about the impact that the Club program has had on your knowledge and behaviors. I am also interested in learning more about your community's interest and ability to work together to solve problems around water, sanitation and hygiene.

6. Please describe what your communities have learned about water, sanitation, hygiene since the Club began.
   Probes: how did the club program make the sharing of WASH information and knowledge easier or more difficult?
7. Please describe any new water, sanitation and hygiene practices that people in your communities have started since the Club began.
8. Have the members of your Club worked together to solve or fix a water, sanitation or hygiene issue since the Club began? If yes, please describe the problem and what your Club did to solve the problem.
   Probes: *Have you come together with other members of your community to work on a problem, fix something, or build something specifically related to water, sanitation or hygiene?*

Behavior Over Time Graphs

Great, thank you. For the final part of this discussion, I would you to discuss how specific water, sanitation and hygiene behaviors and collective action have changed since the Club program started. To help me understand how things have or have not changed, I am going to ask you all to draw some lines that show how things have changed over the past year.

Before we begin, I am going to give you instructions and a couple of examples. First, I would like us to draw a line together that shows the availability of mangoes throughout the year. The horizontal line will be time, starting from January on the left through to December on the right. The vertical line will be the number of mangoes available *(Draw an example of the x- and y-axis, which will be used to draw one line for the entire group)*. We are now going to draw a line that shows how the number of mangoes increases or decreases throughout the year. So in January, do we have a lot of mangoes, some mangoes or no mangoes? How does this change as we move through the year? At what time of year do we have many mangoes? At what time of year are there no mangoes?

Great. Now that we have this line, I want to ask you a few questions. Why are there more mangoes at this time than at others? What are the specific reasons we have more mangoes here and less mangoes here? I am going to write those reasons on the line so that we can better understand the things that affect the availability of mangoes.

Ok. Let us look at another, slightly more complicated example. Think about how tired you are during the day. I would like you to draw a graph that shows how tired you are throughout the day, from morning until

evening. Again, our horizontal line will be time; starting from when you wake up in the morning until you go to bed at night. The vertical line will be your level of tiredness, from not at all tired on the bottom to very tired or unable to stay awake on the top. So, how tired are you when you wake up? How does this change throughout the day? Does it go up or down at different points in time? What about at mid-morning (9 or 10am)? Mid-day? Afternoon? Early evening? Night? Before you go to sleep? *After people have drawn a graph, have them quickly explain their graph.* Why are you more or less tired at different times of the day?

Does everyone understand how to make these lines and think they can do it themselves? Great. Now I am going to have everyone draw his or her own lines. In total, we are going to draw three lines, but we will draw them one at a time. Let us begin with WASH behaviors. I would like each of you to draw a line showing how WASH behaviors have changed in your community since the Club program began. *Reflect back on what the participants have already said about WASH behaviors and use no more than two (2) specific examples.* To make this easier, we will focus on two behaviors that this group identified as important or meaningful. When I asked about the new behaviors or practices that people in your community have adopted because of the Club program, you mentioned (*hand washing with soap*) and (*defecation practices*). Can we use those behaviors for this activity? Great. Let us graph one behavior at a time, starting with (*hand washing*).

9. Please draw a line that shows your perceptions of how often people in your community (*washed your hands with soap at key times (before eating/cooking, after defecating, etc) during the day*) before the Club program started? How did this change once the Club program started? What about as the Club program continued? What about once the Club program ended?

   After you draw your line, please take a moment to consider why you think the change (increase or decrease) happened. What factors, issues, or events contributed to that change? Then I would like you to make notes that explain what factors, issues, or events led to that change. *Give the participants at least 5 minutes (no more than 7 minutes) to draw their line and annotate their line.*

   Now I would like you to describe your line. Who would like to go first? *As each person describes their line, ask the following probing questions for each (discussion should be no longer than 10 minutes):*

   Probes: Why did this change (increase/decrease)? What specific events or factors led to each change? What do others think about this line and the changes it shows? What specific Club activities contributed to this change in working together to (insert the problem they described)? Why? How did the Club influence those that did not join the Club? Does your line represent people who are not Club members? Why are non-members different/the same?

   If the discussants did not mention any social capital factors like trust, social support or social pressure, then ask the following probes: I would also like to know how the social issues we talked about at the beginning of our discussion contributed to the changes you noted. Did trust, group participation, social support, social pressure or other social issues influence these changes? If so, please describe how.

10. Now let us draw a line showing your perceptions of how often people in your community practiced safe defecation practices (used a toilet, latrine, or buried your feces). Before the Club program started, how often did members of your community practice safe defecation practices during the day? How did this change once the Club program started? What about as the Club program continued? What about once the Club program ended?

    After you draw your line, please take a moment to consider why you think the change (increase or decrease) happened. What factors, issues, or events contributed to that change? Then I would like you to make notes that explain what factors, issues, or events led to that change. *Give the participants at least 5 minutes (no more than 7 minutes) to draw their line and annotate their line.*

    Now I would like you to describe your line. Who would like to go first? *As each person describes their line, ask the following probing questions for each (discussion should be no longer than 10 minutes):*

Probes: Why did this change (increase/decrease)? What specific events or factors led to each change? What do others think about this line and the changes it shows? What specific Club activities contributed to this change in defecation practices? Why? How did the Club influence the defecation practices of those that did not join the Club? Does your line represent the defecation practices of people who are not Club members? Why are non-members different/the same?

If the discussants did not mention any social capital factors like trust, social support or social pressure, then ask the following probes: I would also like to know how the social issues we talked about at the beginning of our discussion contributed to the changes you noted. Did trust, group participation, social support, social pressure or other social issues influence these changes? If so, please describe how.

11. Wonderful! We have one more line to draw and discussion. Our last line will show your perceptions of how often people in your community have joined others to work on a common project or solve a collective goal. *Reflect back on what they already told you about WASH collective action and use specific examples from what they said*. When the program started, how often did you come together as a community to work on problems? How did this change once the Club program started? What about as the Club program continued? What about once the Club program ended?

    After you draw your line, please take a moment to consider why you think the change (increase or decrease) happened. What factors, issues, or events contributed to that change? Then I would like you to make notes that explain what factors, issues, or events led to that change. *Give the participants at least 5 minutes (no more than 7 minutes) to draw their line and annotate their line.*

    Now I would like you to describe your line. Who would like to go first? *As each person describes their line, ask the following probing questions for each (discussion should be no longer than 10 minutes):*

    Probes: Why did this change (increase/decrease)? What specific events or factors led to each change? What do others think about this line and the changes it shows? What specific Club activities contributed to this change in working together to (insert the problem they described)? Why? How did the Club influence those that did not join the Club? Does your line represent people who are not Club members? Why are non-members different/the same?

    If the discussants did not mention any social capital factors like trust, social support or social pressure, then ask the following probes: I would also like to know how the social issues we talked about at the beginning of our discussion contributed to the changes you noted. Did trust, group participation, social support, social pressure or other social issues influence these changes? If so, please describe how.

Conclusion

Great work everyone. Is there anything else you would like to tell me about the CHC intervention or the social resources here in your community?

At this point, I do not have any more questions or activities for you. However, I do want to give you an opportunity to ask me questions. I am only able to answer questions about this discussion or the broader study. Do you have any questions?

Well, thank you once again for your time. We do appreciate your sharing your morning/afternoon with us.

APPENDIX 11: CLUB COORDINATOR & MANAGER FOCUS GROUP DISCUSSION GUIDE

Introduction & Consent: was added as a separate script

Introductions and quick icebreaker

Questions:

Thank you for those introductions. It is a pleasure to be with you all today. We appreciate your taking the time to talk with us. I would like to begin by discussing the Community Health Club program. While I have heard about this program, I would like to learn about your thoughts.

1. Please describe the Community Health Club program.
   Probes: *What is the purpose or goal of this program? How did the program work? What did you do as part of this program? What did the members do?*

2. Please describe any differences in socio-economic status, community leadership, infrastructure, access to education, or the Club intervention, that you have observed in these communities.

Social Interactions

Great. Thank you for sharing. I would now like ask you a few questions about how people in the communities you supervise interact with each other. Based on your observations of the communities [insert names of sampled communities], describe how people from these communities have interacted and related to each other since the Club was started. I have three specific questions.

3. What does it mean to have trust or confidence in someone?
   Probes: *how do you define trust? How would you describe the actions or behaviors of someone that you trust?*

Now that we have defined trust and given examples of what it means to have trust or confidence in someone, I would like you to think about the following question:

4. Since the Club started in these communities, did you ever observe or feel people in these communities showed trust or confidence in each other? If so, in what ways?
   Probes: *Please share examples of how people trust or have confidence in each other in these communities. Examples can include letting a neighbor use your favorite bicycle or motorcycle, having confidence that you could leave your home unattended for a week, or believing that what someone tells you is the truth. Please describe any differences between the communities.*

   Probing questions: *How did the Club influence trust or confidence? Do you think the Club helped (increase/decrease) trust amongst Club members? Do you think the Club helped (increase/decrease) trust between Club members and others in the community who did not join the Club? Why did the Club have this effect on trust?*

Great. That was a wonderful. Now I would like you to think about the ways that people support or help each other, and how they come together to make change, in your community.

5. Sometimes we help each other in our day-to-day interactions. Since the Club started, did you ever observe or feel that neighbors were willing to help neighbors with personal issues or do things for each other in these communities? If so, please tell me more about how they helped each other or what they did for the other person.
   Probes: *Please share examples of how people support each other in your community. Examples can include watching a neighbor's children while he/she goes to market, helping a sick neighbor clean clothes,*

or working in each other's field to plant or harvest. Please describe any differences between the communities.

Probing questions: *How did the Club influence how people help each other or support each other? Do you think the Club helped (increase/decrease) helping amongst Club members? Do you think the Club helped (increase/decrease) helping between other members of the community who did not join the Club? Why did the Club have this effect on helping people?*

6. Sometimes we come together as groups to help make change in a community. Since the Club started, did you ever observe people in these communities working together on a project or working together to achieve a common goal? If so, please tell me more about what you observed.
   Probe: *Please share examples of how people work together to make change in these communities. Examples can include working together to build a house or fix a road. If you observed people working together, were they participating in organized groups like the Community Health Club? Please describe any differences between the communities.*

   Probing questions: *How did the Club influence when people working together to solve problems or achieve a common goal? Do you think the Club helped (increase/decrease) working together to solve problems amongst Club members? Do you think the Club helped (increase/decrease) working together to solve problems in other members of the community who did not join the Club? Why did the Club have this effect on working together to solve problems?*

WASH Impact

Thank you everyone. This has been an interesting and engaging discussion. At this point, I would like to change our focus and discuss water, sanitation and hygiene issues in your community. Specifically, I would like to learn more about the impact that the Club program has had on your knowledge and behaviors. I am also interested in learning more about your community's interest and ability to work together to solve problems around water, sanitation and hygiene.

7. Please describe what people have learned about water, sanitation, hygiene since the Club began.
   Probes: how did the club program make the sharing of WASH information and knowledge easier or more difficult?
8. Please describe any new water, sanitation and hygiene practices that people in these communities have started since the Club began.
9. Have the members of these Clubs worked together to solve or fix a water, sanitation or hygiene issue since the Club began? If yes, please describe the problem and what the Club(s) did to solve the problem.
   Probes: *Have members of these communities come together to work on a problem, fix something, or build something specifically related to water, sanitation or hygiene?*

Behavior Over Time Graphs

Great, thank you. For the final part of this discussion, I would like you to discuss how specific water, sanitation and hygiene behaviors and collective action have changed since the Club program started. To help me understand how things have or have not changed, I am going to ask you all to draw some lines that show how things have changed over the past year.

Before we begin, I am going to give you instructions and a couple of examples. First, I would like us to draw a line together that shows the availability of mangoes throughout the year. The horizontal line will be time, starting from January on the left through to December on the right. The vertical line will be the number of mangoes available *(Draw an example of the x- and y-axis, which will be used to draw one line for the entire group)*. We are now going to draw a line that shows how the number of mangoes increases or decreases throughout the year. So in January, do we have a lot of mangoes, some mangoes or no mangoes? How does this change as we move through the year? At what time of year do we have many mangoes? At what time of year are there no mangoes?

Great. Now that we have this line, I want to ask you a few questions. Why are there more mangoes at this time than at others? What are the specific reasons we have more mangoes here and less mangoes here? I am going to write those reasons on the line so that we can better understand the things that affect the availability of mangoes.

Ok. Let us look at another, slightly more complicated example. Think about how tired you are during the day. I would like you to draw a graph that shows how tired you are throughout the day, from morning until evening. Again, our horizontal line will be time; starting from when you wake up in the morning until you go to bed at night. The vertical line will be your level of tiredness, from not at all tired on the bottom to very tired or unable to stay awake on the top. So, how tired are you when you wake up? How does this change throughout the day? Does it go up or down at different points in time? What about at mid-morning (9 or 10am)? Mid-day? Afternoon? Early evening? Night? Before you go to sleep? ***After people have drawn a graph, have them quickly explain their graph.*** **Why are you more or less tired at different times of the day?**

Does everyone understand how to make these lines and think they can do it themselves? Great. Now I am going to have everyone draw his or her own lines. In total, we are going to draw three lines, but we will draw them one at a time. Let us begin with WASH behaviors. I would like each of you to draw a line showing how WASH behaviors have changed in these communities since the Club program began. ***Reflect back on what the participants have already said about WASH behaviors and use no more than two (2) specific examples.*** **To make this easier, we will focus on two behaviors that this group identified as important or meaningful. When I asked about the new behaviors or practices that people in these communities have adopted because of the Club program, you mentioned (*hand washing with soap*) and (*defecation practices*). Can we use those behaviors for this activity? Great. Let us graph one behavior at a time, one community at a time, starting with (*hand washing*).**

10. Please draw a line that shows your perceptions of how often people in these communities (*washed your hands with soap at key times (before eating/cooking, after defecating, etc) during the day*) before the Club program started? How did this change once the Club program started? What about as the Club program continued? What about once the Club program ended?

    After you draw your line, please take a moment to consider why you think the change (increase or decrease) happened. What factors, issues, or events contributed to that change? Then I would like you to make notes that explain what factors, issues, or events led to that change. *Repeat for the second community. Give the participants at least 5 minutes (no more than 7 minutes) to draw and annotate their lines.*

    Now I would like you to describe your lines. Who would like to go first? *As each person describes their lines, ask the following probing questions for each (discussion should be no longer than 10 minutes):*

    Probes: Why did this change (increase/decrease)? What specific events or factors led to each change? What do others think about this line and the changes it shows? What specific Club activities contributed to this change in hand washing practices? Why? How did the Club influence the hand washing practices of those that did not join the Club? Does your line represent the hand washing practices of people who are not Club members? Why are non-members different/the same?

    If the discussants did not mention any social capital factors like trust, social support or social pressure, then ask the following ***probes****:* I would also like to know how the social issues we talked about at the beginning of our discussion contributed to the changes you noted. Did trust, group participation, social support, social pressure or other social issues influence these changes? If so, please describe how.

11. Now let us draw a line showing your perceptions of how often people in these communities practiced safe defecation practices (used a toilet, latrine, or buried your feces). Before the Club program started, how often did members of these communities practice safe defecation practices during the day? How did this

change once the Club program started? What about as the Club program continued? What about once the Club program ended?

After you draw your line, please take a moment to consider why you think the change (increase or decrease) happened. What factors, issues, or events contributed to that change? Then I would like you to make notes that explain what factors, issues, or events led to that change. *Repeat for the second community. Give the participants at least 5 minutes (no more than 7 minutes) to draw and annotate their lines.*

Now I would like you to describe your line. Who would like to go first? *As each person describes their line, ask the following probing questions for each (discussion should be no longer than 10 minutes):*

Probes: Why did this change (increase/decrease)? What specific events or factors led to each change? What do others think about this line and the changes it shows? What specific Club activities contributed to this change in defecation practices? Why? How did the Club influence the defecation practices of those that did not join the Club? Does your line represent the defecation practices of people who are not Club members? Why are non-members different/the same?

If the discussants did not mention any social capital factors like trust, social support or social pressure, then ask the following ***probes****:* I would also like to know how the social issues we talked about at the beginning of our discussion contributed to the changes you noted. Did trust, group participation, social support, social pressure or other social issues influence these changes? If so, please describe how.

12. Wonderful! We have one more line to draw and discussion. Our last line will show your perceptions of how often people in these communities have joined others to work on a common project or solve a collective goal. *Reflect back on what they already told you about WASH collective action and use specific examples from what they said*. When the program started, how often did people in these communities come together to work on problems? How did this change once the Club program started? What about as the Club program continued? What about once the Club program ended?

    After you draw your line, please take a moment to consider why you think the change (increase or decrease) happened. What factors, issues, or events contributed to that change? Then I would like you to make notes that explain what factors, issues, or events led to that change. *Repeat for the second community. Give the participants at least 5 minutes (no more than 7 minutes) to draw and annotate their lines.*

    Now I would like you to describe your line. Who would like to go first? *As each person describes their line, ask the following probing questions for each (discussion should be no longer than 10 minutes):*

    Probes: Why did this change (increase/decrease)? What specific events or factors led to each change? What do others think about this line and the changes it shows? What specific Club activities contributed to this change in working together to (insert the problem they described)? Why? How did the Club influence those that did not join the Club? Does your line represent people who are not Club members? Why are non-members different/the same?

    If the discussants did not mention any social capital factors like trust, social support or social pressure, then ask the following ***probes****:* I would also like to know how the social issues we talked about at the beginning of our discussion contributed to the changes you noted. Did trust, group participation, social support, social pressure or other social issues influence these changes? If so, please describe how.

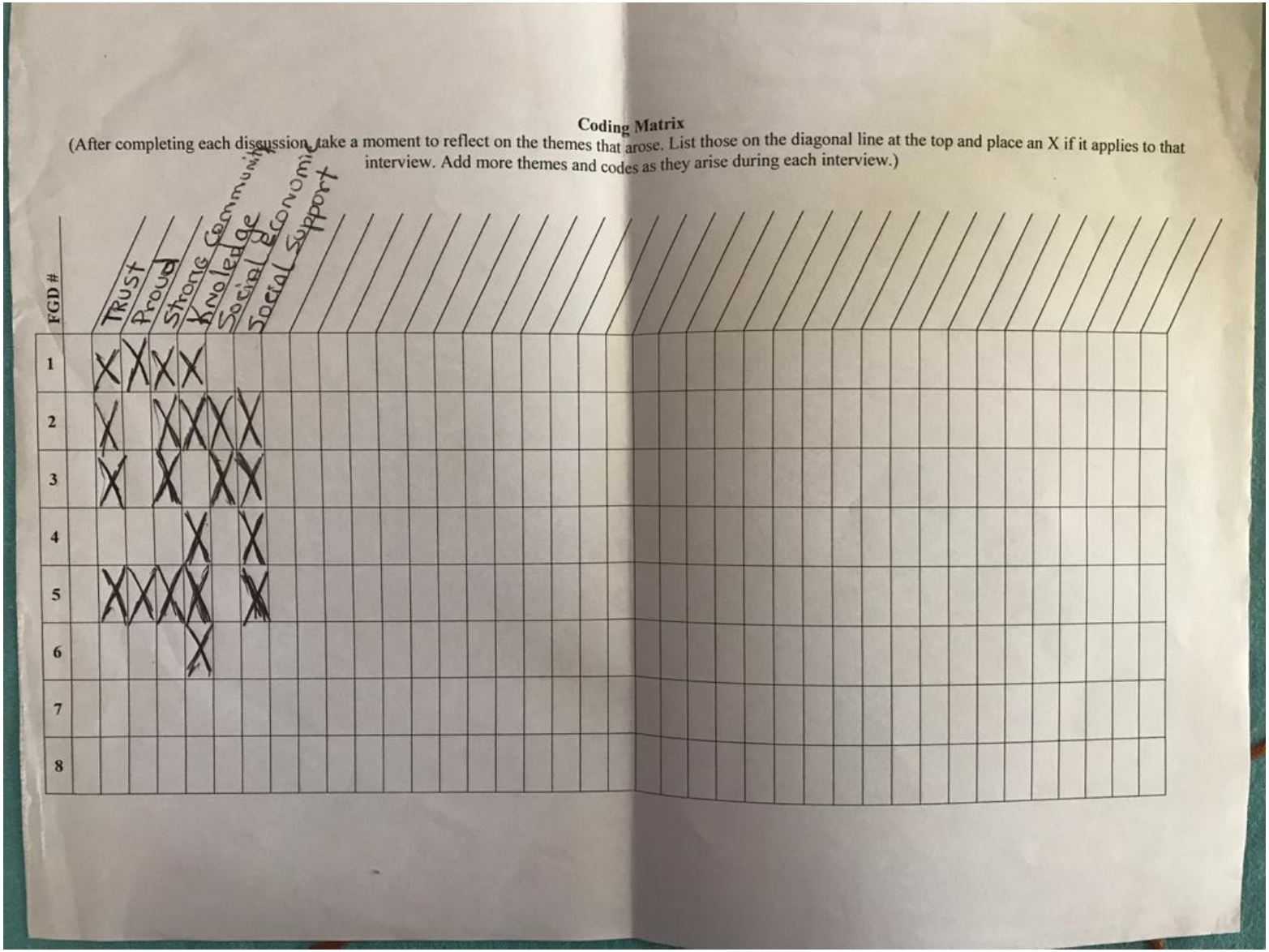
Conclusion

Great work everyone. Is there anything else you would like to tell me about the CHC intervention or the social resources here in your community?

At this point, I do not have any more questions or activities for you. However, I do want to give you an opportunity to ask me questions. I am only able to answer questions about this discussion or the broader study. Do you have any questions?

Well, thank you once again for your time. We do appreciate your sharing your morning/afternoon with us.

APPENDIX 12: EXAMPLE THEMATIC MATRIX



Coding Matrix

(After completing each discussion, take a moment to reflect on the themes that arose. List those on the diagonal line at the top and place an X if it applies to that interview. Add more themes and codes as they arise during each interview.)

FGD #	TRUST	Proud	Strong Community Knowledge	Social Economic	Social Support
1	X	X	X	X	
2	X		X	X	X
3	X		X	X	X
4			X		X
5	X	X	X	X	X
6			X		
7					
8					

APPENDIX 13: QUALITATIVE CODE BOOK

#	Code	Description	Examples
1	Trust	Definitions and examples of trust and trusting relationships between people. Descriptions of the levels of trust between people, as well as how, when and why people trust each other. Predominantly used to describe trust between Club members and between members and the rest of the community. Also descriptions of how trust has been created by and through the Club.	"I believe once people join the club they start living together and that create trust around them and they feel more comfortable to leave their door open and ask the neighbor to keep an eye on the house. It's just because they are part of the club and they develop some trust around them." "Certain diseases don't come near this community because of KSK education. That increase people's trust and that encourage more youth to join us and work together."
2	Sanitation	Descriptions of knowledge about or actual defecation practices like cat sanitation or keeping latrine clean. These can be how things are, how things used to be and how things could be. This also includes descriptions of messages about safe sanitation practices or any response to questions about sanitation or defecation practices. Also includes descriptions of how and when this behavior changed (as part of the behavior over time graphs).	"Many people used to defecate on the grounds but they no longer do it." "The club is a small group of people living in the community, and their duty is to share and teach the other one who are not parts of the club. That is a way to influence the others. They talk to their neighbors on the farm about 'the cat way' practice. Because the members are part of the community and wants to protect themselves and the community, they have to advice people not to do certain things so everyone can be safe and stay healthy."
3	Influence	Descriptions of the factors that influence WASH knowledge and behaviors in both Club members and non-members. These include descriptions of how or when Club members influence non-members, but also how or when they influence each other's behaviors. Any factors or individuals that are described as influencing knowledge or behavior.	"The problem is sometimes the collaboration between the club members and the community happen after graduation. It's the members influence. Let me tell you why… It's very influent(ial). The people in the community joins the club members. It's true there is some change, but it's the neighbor changing in the future. When they saw us doing something positive, they automatically follow us and do things together in the community, they don't necessary joins us to work with us right away." "We invite some people in the meeting, they come to check it out, then they realized there is no foods or drink, they suddenly loose interest, they don't come back. But when they come for the graduation, they saw many people from other places and the members. Now they realized it's an important club, then they want to join, they trust us, they want to be a part of it. Even though they 20 to 30 people, in their mind its 20000 people. You know Haitian loves good appearances."
4	Pride	Descriptions of how or why people are proud to be a part of the Club. Oftentimes this is related to doing something to improve their lives and their community, where they view themselves as leaders or important people in the community, or where they meet people	"…there are always other supervisors from other community health club who come to visit us and advise us to live with each other. So! I believe they establish some kind of trust in us, they listen to us and they do what we tell them. I can also add something else. There is always different other community agent who come to meet us, they come to my house every now

		from outside their community and feel important. This also includes descriptions of making others, usually the Club facilitators or supervisors, proud of the work they do as a Club.	and then to ask us about the club and how we are doing with the club. They come to check to see how do I take care of myself and if I purify my water the right way. Today again I'm very proud to see you guys and specially this white man that I believe I saw before. I'm very proud I won't give up on the club." "What really motivate you to work together. We are motivated and united and we want to make our leaders proud."
5	Knowledge	This has two main components. Descriptions of gaps in knowledge or information and descriptions of what information or knowledge people gained from the program. This is not just related to water, sanitation and hygiene, but also other important skills like making soap and homemade pesticides.. This code generally goes with other codes like hand washing, water or sanitation.	"Why people did not wash their hands before? As you know we are living in a rural area, things are not easy here , and they did not have the knowledges and the informations. Now that we have the club we share the knowledges about hygiene and health." "when the club first start the majority of people used to do it [defecate] in bad condition, and we believe the reason is very simple: They did not have much information, they were very negligent."
6	Know-Learn	Sub-code of knowledge where members describe what they learned within the Club. This code is solely focused on what the Club members learned and should not capture descriptions of non-members. This knowledge can again be water, sanitation and hygiene, working together, and other health knowledge or skills.	"I believe they listen to us because they trust us. they saw the importance of the information we bring to them about their health. We teach them about the diseases they can catch if they continue to do it in bad condition. We brought some cards with images to teach them, we educate them thru songs and they see the change in their health and in the community." "From the club, we learned that water is life, it can help you live a good healthy life and at the same time it can destroy your life. The water we get form the pipe come from a spring source and it came from far away, by the time it gets here it's get contaminated. Like they always say, 'Clear water is not clean water' so when we get the water we have to purify it before we drink it. Beside this most people in this community use "latrine" and we learned that an open latrine is very dangerous and we have to keep it close all the time, because the flies and insects that come from the latrine can contaminate our foods and get us sick. We learn all of these informations from the club." "In the beginning we did not know, now we have lots of informations and encouragement because of KSK."
7	Know-Share	Sub-code of knowledge where members describe how they or their Club share what they learn with others in their community and beyond. This is focused on sharing outside of their immediate club membership and includes hand washing, sanitation, and working together.	"Actually once we graduated we start teaching other people about it [hand washing], so we do it even more because we know the advantage and the disadvantage. We taught people the same things that we learn so they can protect themselves from getting sick."

			"Ohh Yes! I believe there is trust between us, the other people share their knowledges with us and we share with other people in the community. They taught us how to wash our hands and we went and teach other people. It's because we trust each other and want to help others. We wouldn't share if we did not trust what we learned was good and positive. Now that cholera is everywhere you need to trust someone to take his/her advices before you can go and tell other people to do the same thing."
8	Health	Discussions and descriptions of health or the health impact of what people have learned in the Club. This also captures general descriptions of health threats or the general health benefits of the knowledge and behaviors gained through the Club. This can include descriptions of specific diseases like diarrhea or cholera, and treatment practices like oral rehydration solutions.	"One problem we encounter in the community sometimes is the diarrhea problem, and once they catch it they have to run to the hospital. But there is something one can do that can help them before going to the hospital, its a very simple remedies, it's a "oral serum". Before the club started, they did not know how to do it, but now we taught them and now they know and it's helpful. When a kid or an adult has a diarrhea in the community, they don't have to worry much and even if they don't have money they can make an "oral serum" before they go to the hospital. That's help them save money and may also save lives." "They did not have much information of what kind of diseases they can catch when they don't wash their hands." "*Why do you wash now?* It's very simple we have all the knowledges and information about germs and diseases that we can catch if we don't wash them well. And we don't want to get sick."
9	Disease Prevention	Sub-code of health that is focused specifically on descriptions of the diseases that have been prevented because of knowledge and behavior change. These include diarrhea, malaria, cholera, and skin diseases.	"More people wants to protect their health and their environment, we realize that there was less cholera in the community , so we wash even more." "then, after they learn that they can get sick from not washing their hands and they realized they did not catch certain diseases, then, they start washing more." "Yes, we trust them, there is lots of diseases out there. They help us avoid getting sick, they teach us how to protect ourselves."
10	Social Network	General and specific descriptions of who people know and the relationships members have because they are a member of the Club. These descriptions focus on both bonding (internal to a community or group) and bridging (external to a community or group) capital, see sub-codes below. This code is used for descriptions of the	"Now they sit together and discuss how they can change few things in the community, before the pastors wouldn't sit with the voodoo priests, now they do sit together. The club bring trust among them. They are trying to work together and live together."

		general relationships that have been generated by participating in the Club, where it is not clear or stated whether the relationships are internal or external to the Club.	"The reason why we work so much together is because we make new friends and we trust each other more."
11	Bonding	Sub-code of Social Network used to capture descriptions of the relationships internal to the Club. This code is related to who people know from within their community because they have joined the same Club, the relationships that have been created between these individuals and the benefits of these relationships, including the psycho-social benefits.	"Not only the club increase trust between the club members. Because they was not friends before, now that they are part of the club they become friends with each other, and it brings more confidence and trust by learning something new." "The minute that they joined the club, they feel comfortable when they learning and doing the activities, they feel very good. They feel like there is a link that bound them together and they feel stronger together." "We are very close to each other in the group it's easier to trust each order *How long you have been part of this group? About a year? How come you trust people you have been friend with for only one year than other people that you know for 15 to 20 years?* Because we live like family."
12	Bridging	Sub-code of Social Network used to capture descriptions of the relationship external to the Club. These relationships can be with other members of the same community, but who have not joined the Club, as well as with individuals or organizations external to the community. This code is related to who people know outside of their Club because of their membership in the Club, the relationships that have been created with these individuals or organizations and the benefits of these relationships, including psycho-social benefits.	"The day of the graduation, there was all kind of people and important people involve, there was mayors, family members friends and special guess and other organization from different community."
13	Water	Descriptions of anything related to drinking water and water sources. This can include water treatment using Aquatabs or Gayden dlo, protection of springs, improvements to water sources, or attitudes towards drinking water practices.	"In my community I remember that I went to someone house to invite her to be part of the club, her house was not a place that I felt comfortable to drink water or eat because it did not look so clean. But after she became parts of the club, everything changes in the house, everything was very clean and very well organized. I had more trust and I was very confident to drink water at her house." "Talking about water, some people think because the water is clear that's mean it's clean, it's not really true. We learned that from KSK and they also teach us how to purify water to drink in clean recipient, also we learned to cover our water so it stay clean."

14	Hand Washing	Description of anything related to hand washing. This can include construction of tippy taps (Kreyol hand washing facilities), proper methods for hand washing, or general attitudes towards hand washing practices. Also includes descriptions of how and when this behavior changed (as part of the behavior over time graphs).	"The reason why we did not have too many people washing their hands is because the club was not around yet, we did not receive any information about hygiene and hands washing, now that we had workshop and we have more knowledges we got more people involve. *OK and what happen when we get half way before graduation?* Half way before graduation, we still wash our hands. *And why?* Because now people know if they don't wash their hands they will catch germs and get sick. *What about after graduation?* Because everyone in the community talk about it, how important and helpful it is everywhere." "Then finally everyone knows to have a TIPITAP at their house to wash their hands, and every club member start washing each other to make sure they do what. They need to do because the facilitator can stop by any time to supervise. It's like a family affair they advise each other to help each other save lives and at the end they get used to it so they do it all the time."
15	Behavior	These are general descriptions of WASH behaviors, both old and new practices or changes in practices that have occurred because of the Club. These are general, and can include hand washing practices, use of toilets, cat sanitation and drinking water. This code generally goes with other codes like hand washing, water or sanitation. this should not be descriptions of knowledge, but actual practices like cat sanitation, or using a tippy tap.	"After 4 to 5 months, there was workshops from KSK and they get lots of information and they understand how important it is not to do it on the ground near the river so they can stay healthy. They start building more latrines at home start and do it in a good condition. That was a good thing for the community." "we do the cat practice, that's mean we dig a whole and we poop in it then we cover it. After the informations, we find out it was not a good thing to do it on the grounds. Then we start building latrines." "Half way to graduation cholera was going down, and people slow down on washing their hands, they think cholera was gone, but they did not stop washing all the way."
16	Working Together	Descriptions of how, when and why people work together for common goals, both within and outside of the Club, before and after the Club started. These descriptions do not have to be focused on WASH and can be related to any problem the community has identified. This code also includes descriptions of how the Club influenced collective action/working together. In general, people tended to work together before the	"In our culture not too long ago we use to have what we call "kombit" where our grand parents did not spend much money farming because they use to help each other working on the farms. Now those days you need to hire people, people no longer help each other farming. Now with the club, people start going back to the old tradition where they go help each other. That's what the club members told us. Now they sit together and discuss how they can change few things in the community, before the pastors wouldn't sit with the voodoo priests, now they do sit together. The club

		Club began, but the Club helped encourage people do this more.	bring trust among them. They are trying to work together and live together. Again that is trust." "*What about when the club was about to graduate did you notice something different.* We got even better, We became very familiar to each other. We get together and we work much better together." "my club always does that, but it's not just because of the club, we used to do it before the club came around. We used to clean the streets in the neighborhoods. But with the club we get together more to do something."
17	Money	Description of the economic benefits and/or financial savings that Club members have realized due to being a part of the Club. This is either because of the knowledge they have gained (oral rehydration) or the behaviors they practice (hand washing), or skills they have learned (making soap).	"I can continue with the same subject, the socio economic. I can give you an example for my club. We organize ourselves and teach the young ladies in my club how to make liquid soap. They are actuating selling the soap for 30 gdes for a small bottle. This is a very good thing for the community and that's encourage more people to join the club." "Sometimes people don't get a job because they are not part of a social organization, now the club members has this advantage. We have a case where someone apply at the hospital before she was part of that club, a year later she went back and got the job because she was part of a social club they trust her more and she becomes more confident in herself."
18	Social Support	Descriptions of Club members helping each other with tasks or solving personal problems. These can include helping when a neighbor is sick or watching a child.	"Yes in the community we help each other. Not too long ago I was on my way and there was an accident on the road, I did not have much money to help, but I did the best I can, and all the neighbors came out and help in their level." "Like if someone is sick in the community we get together and help how we can. It might be money problem to go to the hospital, or if someone is sick, we go to their house and help wash their clothes. All of this are part of the job." "if I have a problem at my house, many people in this community will come to help me."
19	Social Solidarity	These are description of Club members and other members of the community sharing a unity of direction, goals and interests. Descriptions of people having the same mindset, beliefs and practices. Also directly related to the proverb (business of the goat is the business of the sheep).	"*Is that mean the neighbor return the favor sometimes?* If he/she wants, she can help, but we… in this club have a different set of mind, we receive workshops and that is our job to help when needed."

			"It's not a matter club members and non club members. This is a small community. We all work together. We are no longer selfish, we become one."
20	Social Pressure	These are descriptions of how positive peer or social pressure influences changes in behavior. Some people described shame as driving force for changing defecation practices, which is a type of social pressure. This code is closely related to the Influence code, and could probably be considered a sub-code since pressure is one form of social influence.	"Then finally everyone knows to have a TIPITAP at their house to wash their hands, and every club member start washing each other to make sure they do what. They need to do because the facilitator can stop by any time to supervise. It's like a family affair they advise each other to help each other save lives and at the end they get used to it so they do it all the time." "There is always different other community agent who come to meet us, they come to my house every now and then to ask us about the club and how we are doing with the club. They come to check to see how do I take care of myself and if I purify my water the right way." "By the time we graduate everybody was very motivated and they stop doing it in bad condition. Everyone was watching and advising each other the community to stop doing it in bad condition. KSK teach us not too do it on the ground because it will bring diseases to the community and we all agree to do it in good condition."
21	Reciprocity	Descriptions of times or expectations that someone will do something for another person because there is a stated or unstated understanding that the other person will help you in return. Quid pro quo.	"I believe the point of helping someone is because you know that person will help you back one day, or because the person helped you before."
22	Hygiene	Descriptions of hygiene behaviors or practices that do not include hand washing or defecation practices. This is mostly related to clean households, clean kitchens and clean environment.	"I remember when I first move to a neighborhood, my street was always dirty with trash, and I did not waste time I started cleaning the front of my door everyday and people did not understand why I chose to do that. I never gave up, I kept on doing it, and advice them to clean up and how to treat the trash in a plastic bag to avoid flies, because flies will come to your foods and can get you sick. it's not OK to live around so much trash and flies, and after a while other people in the neighborhood start doing the same thing and kept the neighborhood very clean."
23	Participate	Descriptions of the reason why people choose to join and participate in the activities of a Community Health Club. These are the influences on people's decision to join a Club and can include access to information/knowledge or a desire to be part of the social group that works together.	"We had few more people who joined the club and some members even bring more people because they find some good informations." "Certain diseases don't come near this community because of KSK education. That increase people's trust and that encourage more youth to join us and work together."
24	Barriers	Descriptions of the barriers that people face to joining a Club, to practicing new behaviors promoted through the Club, to diffusing information within the community,	"We invite some people in the meeting, they come to check it out , then they realized there is no foods or drink, they suddenly loose interest, they don't come back."

		and to engaging in collective action. These can include physical, psychological, financial or material barriers like a lack of money to build a toilet or a lack of time to participate in Club activities.	"We can say it goes up a little bit. Not a big change, because people don't have the means to build latrines." "The mangoes season is the problem all the kids are out there looking for mangoes, they don't have time to go home and they have no other choices. But after the season is over it goes back up again."

REFERENCES

AfricaAHEAD. (2019). AfricaAHEAD Countries. Retrieved from https://www.africaahead.org/countries/.

Agampodi, T. C., Agampodi, S. B., Glozier, N., & Siribaddana, S. (2015). Measurement of social capital in relation to health in low and middle income countries (LMIC): A systematic review. *Social Science & Medicine*, *128*, 95–104. https://doi.org/10.1016/j.socscimed.2015.01.005.

Akçomak, I. S., & Ter Weel, B. (2009). Social capital, innovation and growth: Evidence from Europe. *European Economic Review*, *53*(5), 544–567.

Aubrey, D. (2009). Community based sanitation entrepreneurship in Mukuru and Korogocho informal settlements, Nairobi. In *WEDC 34th International Conference*. © WEDC, Loughborough University. Retrieved from https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/29152.

Azurduy, L., Stakem, M., & Wright, L. (2007). *Assessment of the Community Health Club Approach: Koinadugu District, Sierra Leone*.

Bakshi, R. K., Mallick, D., & Ulubaşoğlu, M. A. (2015). Social Capital and Hygiene Practices among the Extreme Poor in Rural Bangladesh. *The Journal of Development Studies*, *51*(12), 1603–1618. https://doi.org/10.1080/00220388.2015.1068291.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173.

Barrington, D. J., Sridharan, S., Saunders, S. G., Souter, R. T., Bartram, J., Shields, K. F., … Hughes, R. K. (2016). Improving community health through marketing exchanges: A participatory action research study on water, sanitation, and hygiene in three Melanesian countries. *Social Science & Medicine (1982)*, *171*, 84–93. https://doi.org/10.1016/j.socscimed.2016.11.003.

Beesley, J., & Feeny, E. (2016a). SWIFT Story of Sustainable Change: Promoting health and well-being through a club in Katchungwe, DRC.

Beesley, J., & Feeny, E. (2016b). *'This club is now the light of our village': A community health club set up by SWIFT promotes health and well-being in Katchungwe*. London (UK).

Beesley, J., & Feeny, E. (2016c). *'When others see what we are achieving, they want to join': A community health club set up by SWIFT inspires improvements in hygiene and sanitation in Mwandiga I*. London (UK).

Beesley, J., Feeny, E., Thomas, M. A., & Mathiabu, K. (2016). *'I've learned a lot of things': A community health club set up by SWIFT changes sanitation and hygiene habits in Matongo*. London (UK).

Berkman, L. F., & Glass, T. (2000). Social integration, social networks, social support, and health. In L. Berkman & I. Kawachi (Eds.), *Social Epidemiology* (pp. 137–173). Oxford; New York: Oxford University Press.

Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine*, *51*(6), 843–857.

Bisung, E., & Elliott, S. J. (2014). Toward a social capital based framework for understanding the water-health nexus. *Social Science and Medicine*, *108*, 194–200. https://doi.org/10.1016/j.socscimed.2014.01.042.

Bisung, E., Elliott, S. J., Schuster-Wallace, C. J., Karanja, D. M., & Bernard, A. (2014). Social capital, collective action and access to water in rural Kenya. *Social Science and Medicine*, *119*, 147–154. https://doi.org/10.1016/j.socscimed.2014.07.060.

Boschi-Pinto, C., Velebit, L., & Shibuya, K. (2008). Estimating child mortality due to diarrhoea in developing countries. *Bulletin of the World Health Organization*, *86*(9), 710–717. https://doi.org/10.2471/BLT.07.050054.

Bourdieu, P. (1986). The Forms of Capital. In J. Richardson (Ed.), *Handbook of Theory and Research for the Sociology of Education* (pp. 241–258). Westport, Conn: Greenwood.

Brooks, J., Adams, A., Bendjemil, S., & Rosenfeld, J. (2015). Putting heads and hands together to change knowledge and behaviours: Community Health Clubs in Port-au-Prince, Haiti. *Waterlines*, *34*(4), 379–396. https://doi.org/10.3362/1756-3488.2015.033.

Brown, J., Cavill, S., Cumming, O., & Jeandron, A. (2012). Water, sanitation, and hygiene in emergencies: summary review and recommendations for further research. *Waterlines*, *31*(1–2), 11–29.

Bullers, S. (2001). The mediating role of perceived control in the relationship between social ties and depressive symptoms. *Women & Health*, *31*(2–3), 97–116.

Cairncross, S., Hunt, C., Boisson, S., Bostoen, K., Curtis, V., Fung, I. C. H., & Schmidt, W. P. (2010). Water, sanitation and hygiene for the prevention of diarrhoea. *International Journal of Epidemiology*, *39*(SUPPL. 1). https://doi.org/10.1093/ije/dyq035.

Calow, R., Bonsor, H., Jones, L., O'Meally, S., MacDonald, A., & Kaur, N. (2011). *Climate change, water resources and WASH: a scoping study*. *Overseas Development Institute*. Overseas Development Institute.

Cameron, L. A., Olivia, S., & Shah, M. (2015). Initial Conditions Matter: Social Capital and Participatory Development. *SSRN Electronic Journal*, (9563), 35 pp. https://doi.org/http://dx.doi.org/10.2139/ssrn.2704614.

Campbell, C., & Jovchelovitch, S. (2000). Health , community and development : towards a social psychology of participation. *Community & Applied Social Psychology*, *10*, 255–270. https://doi.org/10.1002/1099-1298(200007/08)10.

Campbell, C., MacPhail, C., C, C., & C, M. (2002). Peer education, gender and the development of critical consciousness: participatory HIV prevention by South African youth. *Social Science & Medicine*, *55*(2), 331–345. Retrieved from https://auth.lib.unc.edu/ezproxy_auth.php?url=http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=106817891&site=ehost-live&scope=site.

Carpiano, R. M. (2006). Toward a neighborhood resource-based theory of social capital for health: Can Bourdieu and sociology help? *Social Science and Medicine*, *62*(1), 165–175. https://doi.org/10.1016/j.socscimed.2005.05.020.

Carpiano, R. M. (2008). Actual or potential neighborhood resources and access to them: Testing hypotheses of social capital for the health of female caregivers. *Social Science and Medicine*, *67*(4), 568–582. https://doi.org/10.1016/j.socscimed.2008.04.017.

Carr, R., & Strauss, M. (2001). Excreta-related infections and the role of sanitation in the control of transmission. In L. Fewtrell & J. Bartram (Eds.), *Water Quality-Guidelines, Standards and Health: Assessment of risk and risk management for water-related infectious disease*. Cornwall, UK: IWA Publishing.

Casey, K., Glennerster, R., & Miguel, E. (2012). RESHAPING INSTITUTIONS : EVIDENCE ON AID IMPACTS USING A PREANALYSIS PLAN * Katherine Casey Rachel Glennerster I . INTRODUCTION Many scholars have argued that the accountability and in- clusiveness of government institutions are key determinants of econom. *The Quaterly Journal of Economics*, *127*(4), 1755–1812. https://doi.org/10.1093/qje/qje027.Advance.

Charles, J. (2018). How Chile is coping with an influx of Haitian migrants. *Miami Herald*. Retrieved from https://www.miamiherald.com/news/nation-world/world/americas/haiti/article201431154.html.

Clasen, T., Boisson, S., Routray, P., Torondel, B., Bell, M., Cumming, O., … Schmidt, W.-P. (2014). Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial. *Lancet Global Health*, *2*(11), e645–e653. https://doi.org/10.1016/S2214-109X(14)70307-9.

Cohen, S., Underwood, L. G., & Gottlieb, B. H. (2000). *Social support measurement and intervention: A guide for health and social scientists*. (S. Cohen, L. G. Underwood, & B. H. Gottlieb, Eds.). Oxford; New York: Oxford University Press.

Coleman, J. S. (1988). Social Capital in the Creation of Human-Capital. *AMERICAN JOURNAL OF SOCIOLOGY*, *94*(S), S95–S120. https://doi.org/10.1086/228943.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Dangour, A. D., Watson, L., Cumming, O., Boisson, S., Che, Y., Velleman, Y., … Uauy, R. (2013). Interventions to improve water quality and supply, sanitation and hygiene practices, and their effects on the nutritional status of children. *Cochrane Database of Systematic Reviews*, *8*(8), CD009382. https://doi.org/10.1002/14651858.CD009382.pub2.

Delea, M. G. (2019). Social constructs, behaviour change, and the uptake of community-based WASH interventions: Metrics and analytical approaches for measuring collective efficacy. London School of Hygiene & Tropical Medicine.

Delea, M., Sclar, G., Woreta, M., Haardörfer, R., Nagel, C., Caruso, B., … Freeman, M. (2018). Collective efficacy: Development and validation of a measurement scale for use in public health and development programmes. *International Journal of Environmental Research and Public Health*, *15*(10), 2139.

Direction Nationale d'leau potable et de l'assainissement (DINEPA). (2014). *Document d'orientation strategique pour l'assainissement en Haiti*. Retrieved from https://www.dinepa.gouv.ht/strategie-nationale-de-lassainissement/.

Dreibelbis, R., Winch, P. J., Leontsini, E., Hulland, K. R., Ram, P. K., Unicomb, L., & Luby, S. P. (2013). The integrated behavioural model for water, sanitation, and hygiene: a systematic review of behavioural models and a framework for designing and evaluating behaviour change interventions in infrastructure-restricted settings. *BMC Public Health*, *13*(1), 1015. https://doi.org/10.1186/1471-2458-13-1015.

Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community readiness: Research to practice. *Journal of Community Psychology*, *28*(3), 291–307.

Ellaway, A., & Macintyre, S. (2000). Social capital and self-rated health: support for a contextual mechanism. *American Journal of Public Health*, *90*(6), 988.

Eriksson, M. (2011). Social capital and health--implications for health promotion. *Global Health Action*, *4*, 5611. https://doi.org/10.3402/gha.v4i0.5611.

Ervasti, H., Kouvo, A., & Venetoklis, T. (2019). Social and Institutional Trust in Times of Crisis: Greece, 2002–2011. *Social Indicators Research*, *141*(3), 1207–1231. https://doi.org/10.1007/s11205-018-1862-y.

Esrey, S. A., Potash, J. B., Roberts, L., & Shiff, C. (1991). Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma. *Bulletin of the World Health Organization*, *69*(5), 609–621. https://doi.org/http://dx.doi.org/10.2147/IJWH.S77807.

Fewtrell, L., Kaufmann, R. B., Kay, D., Enanoria, W., Haller, L., Colford, J. M., … Colford, J. M. (2005). Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis. *The Lancet Infectious Diseases*, *5*(1), 42–52. https://doi.org/10.1016/S1473-3099(04)01253-8.

Frechtling, J. A. (2007). *Logic modeling methods in program evaluation.* Jossey-Bass.

Freeman, M. C., Ogden, S., Jacobson, J., Abbott, D., Addiss, D. G., Amnie, A. G., … Utzinger, J. (2013). Integration of Water, Sanitation, and Hygiene for the Prevention and Control of Neglected Tropical Diseases: A Rationale for Inter-Sectoral Collaboration. *PLoS Neglected Tropical Diseases*, *7*(9). https://doi.org/10.1371/journal.pntd.0002439.

Freire, P. (1970). *Pedagogy of the Oppressed*. *Herder & Herder, New York*. New York: Herder & Herder.

Funnell, S. C., & Rogers, P. J. (2011). *Purposeful program theory: Effective use of theories of change and logic models* (Vol. 31). John Wiley & Sons.

Gelting, R., Bliss, K., Patrick, M., Lockhart, G., & Handzel, T. (2013). Water, Sanitation and Hygiene in Haiti: Past, Present, and Future. *American Journal of Tropical Medicine and Hygiene*, *89*(4), 665–670. https://doi.org/10.4269/ajtmh.13-0217.

Gero, A., Carrard, N., Murta, J., & Willetts, J. (2014). Private and social enterprise roles in water, sanitation and hygiene for the poor: a systematic review. *Journal of Water, Sanitation and Hygiene for Development*, *4*(3), 331–345.

Gilbert, K. L., Quinn, S. C., Goodman, R. M., Butler, J., & Wallace, J. (2013). A meta-analysis of social capital and health: A case for needed research. *Journal of Health Psychology*, *18*(11). https://doi.org/10.1177/1359105311435983.

Gilchrist, V., & Williams, R. (1999). Key Informant Interviews. In B. F. Crabtree & W. L. Miller (Eds.), *Doing qualitative research* (2nd ed., pp. 71–88). Newbury Park, California: Sage Publications.

Grootaert, C., Narayan, D., Jones, V. N., & Woolcock, M. (2004). *Measuring social capital: An integrated questionnaire*. *World Bank Working Paper*. Retrieved from https://www.scopus.com/inward/record.uri?eid=2-s2.0-4744353137&partnerID=40&md5=562ac9fc0a269115caa1a32cce2b61cc.

Guillaume, Y., Ternier, R., Vissieres, K., Casseus, A., Chery, M. J., & Ivers, L. C. (2018). Responding to cholera in Haiti: Implications for the national plan to eliminate cholera by 2022. *Journal of Infectious Diseases*, *218*(Suppl 3), S167–S170. https://doi.org/10.1093/infdis/jiy491.

Hagan, J., Merkens, H., & Boehnke, K. (1995). Delinquency and disdain: Social capital and the control of right-wing extremism among East and West Berlin youth. *American Journal of Sociology*, *100*(4), 1028–1052.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, *162*, 1243–1248. https://doi.org/10.1080/19390450903037302.

Harpham, T. (2008). The measurement of community social capital through surveys. In I. Kawachi, S. V. Subramanian, & D. Kim (Eds.), *Social Capital and Health* (pp. 51–62). New York; London: Springer.

Harpham, T., Grant, E., & Thomas, E. (2002). Measuring social capital within health surveys: key issues. *HEALTH POLICY AND PLANNING*, *17*(1), 106–111. https://doi.org/10.1093/heapol/17.1.106.

Harter, M., Mosch, S., & Mosler, H.-J. (2018). How does Community-Led Total Sanitation (CLTS) affect latrine ownership? A quantitative case study from Mozambique. *BMC Public Health*, *18*(1), 387.

Hassmiller Lich, K., Minyard, K., Niles, R., Dave, G., & Gillen, E. (2014). System Dynamics and Community Health. In J. Burke & S. Albert (Eds.), *Emerging Methods in Community Public Health Research* (pp. 129–170). New York: Springer Publishing Co.

Helliwell, J. F. (2003). How's life? Combining individual and national variables to explain subjective well-being. *Economic Modelling*, *20*(2), 331–360.

Hoehner, C. M., Sabounchi, N. S., Brennan, L. K., Hovmand, P., & Kemner, A. (2015). Behavior-over-time graphs: Assessing perceived trends in healthy eating and active living environments and behaviors across 49 Communities. *Journal of Public Health Management and Practice*, *21*, S45–S54. https://doi.org/10.1097/PHH.0000000000000211.

Howard, G., Charles, K., Pond, K., Brookshaw, A., Hossain, R., & Bartram, J. (2010). Securing 2020 vision for 2030: climate change and ensuring resilience in water and sanitation services. *Journal of Water and Climate Change*, *1*(1), 2–16.

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687.

Hulland, K., Martin, N., Dreibelbis, R., DeBruicker Valliant, J., & Winch, P. J. (2015). *What factors affect sustained adoption of safe water, hygiene and sanitation technologies? A systematic review of literature*. London: EPPI-Center, Social Science Research Unit, UCL Institute of Education, University College London. https://doi.org/10.13140/RG.2.1.5031.4329.

Humphrey, J. H. (2009). Child undernutrition, tropical enteropathy, toilets, and handwashing. *The Lancet*, *374*(9694), 1032–1035. https://doi.org/10.1016/S0140-6736(09)60950-8.

Hurtado, D., Kawachi, I., & Sudarsky, J. (2011). Social capital and self-rated health in Colombia: The good, the bad and the ugly. *Social Science and Medicine*, *72*(4), 584–590. https://doi.org/10.1016/j.socscimed.2010.11.023.

Hutton, G., & Bartram, J. (2008). Global costs of attaining the Millennium Development Goal for water supply and sanitation. *Bulletin of the World Health Organization*, *86*(1), 13–19. https://doi.org/10.2471/BLT.07.046045.

Hutton, G., & Haller, L. (2004). Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level. *World Health Organization*, 1–87. https://doi.org/10.2166/wh.2007.008.

Hutton, G., Haller, L., & Bartram, J. (2007). Global cost-benefit analysis of water supply and sanitation interventions. *Journal of Water and Health*, *5*(4), 481–501. https://doi.org/10.2166/wh.2007.009.

IBM. (2018). Categorical Principal Components Analysis. Retrieved September 14, 2018, from https://www.ibm.com/support/knowledgecenter/SSLVMB_25.0.0/statistics_casestudies_project_ddita/spss/tutorials/catpca_table.html.

Isham, J., & Kahkonen, S. (2002). How do participation and social capital affect community-based water projects? Evidence from Central Java, Indonesia. In *Social Capital and Development* (pp. 155–187). Cambridge University Press.

Isham, J., & Kähkönen, S. (1999). *What determines the effectiveness of community-based water projects? Evidence from Central Java, Indonesia on demand responsiveness, service rules*. *Social Capital Initiative Working Paper*. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:WHAT+DETERMINES+THE+EFFECTIVENESS+OF+COMMUNITY-BASED+WATER+PROJECTS?+EVIDENCE+FROM+CENTRAL+JAVA,+INDONESIA+ON+DEMAND+RESPONSIVENESS,+SERVICE+RULES,+AND+SOCIAL+CAPITAL#3.

Islam, M. K., Merlo, J., Kawachi, I., Lindström, M., & Gerdtham, G. (2006). Social capital and health : Does egalitarianism matter ? A literature review. *International Journal for Equity in Health*, *5*(3), 1–28. https://doi.org/10.1186/1475-9276-5-3.

Jeyakumar, A., & Ghugre, P. (2017). Assessment of personal hygiene and sanitation using a composite index among adolescent girls and their households in urban slums of Pune, Maharashtra. *Journal of Water, Sanitation and Hygiene for Development*, *7*(2), 323–330. https://doi.org/http://dx.doi.org/10.2166/washdev.2017.127.

Kähkönen, S. (1999). Does social capital matter in water and sanitation delivery? *Social Capital Initiative Working Paper No. 9*, (9).

Kawachi, I., & Berkman, L. (2000). Social cohesion, social capital, and health. In L. F. Berkman & I. Kawachi (Eds.), *Social epidemiology* (pp. 174–190). Oxford; New York: Oxford University Press.

Kawachi, I., & Berkman, L. F. (2001). Social ties and mental health. *Journal of Urban Health*, *78*(3), 458–467.

Kawachi, I., Bird, C. E., Conrad, P., Fremont, A. M., Timmermans, S., Bird Chloe E., (Ed), … Timmermans Stefan, (Ed). (2010). Social capital and health. In *Handbook of medical sociology, 6th ed.* (pp. 18–32). Vanderbilt University Press. Retrieved from https://auth.lib.unc.edu/ezproxy_auth.php?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2010-23083-002&site=ehost-live&scope=site.

Kawachi, I., Kennedy, B. P., & Glass, R. (1999). Social capital and self-rated health: a contextual analysis. *American Journal of Public Health*, *89*(8), 1187–1193.

Kawachi, I., Kennedy, B. P., Lochner, K., & Prothrow-Stith, D. (1997). Social capital, income inequality, and mortality. *American Journal of Public Health*, *87*(9), 1491–1498.

Kawachi, I., Subramanian, S., & Kim, D. (2008). Social capital and health: A Decade of Progress and Beyond. In I. Kawachi, S. V. Subramanian, & D. Kim (Eds.), *Social Capital and Health* (pp. 1–291). New York; London: Springer. https://doi.org/10.1007/978-0-387-71311-3.

Kawachi, I., Subramanian, S., & Kim, D. (2008). Social Capital and Health. In I. Kawachi, S. Subramanian, & D. Kim (Eds.), *Social Capital and Health* (Vol. 323, pp. 1–26). New York; London: Springer. https://doi.org/10.1007/978-0-387-71311-3.

Keating, D. P. (2000). Social capital and developmental health: making the connection. *Journal of Developmental & Behavioral Pediatrics*, *21*(1), 50–52.

Kelly, K. J., Edwards, R. W., Comello, M. L. G., Plested, B. A., Thurman, P. J., & Slater, M. D. (2003). The community readiness model: A complementary approach to social marketing. *Marketing Theory*, *3*(4), 411–426.

Korpe, P. S., & Petri, W. A. (2012). Environmental enteropathy: critical implications of a poorly understood condition. *Trends in Molecular Medicine*, *18*(6), 328–336.

Kotter, J. P. (2007). Leading Change: Why transformation efforts fail. *Harvard Business Review*, (0), 1–9.

Koutsou, S., Partalidou, M., & Ragkos, A. (2014). Young farmers' social capital in Greece: Trust levels and collective actions. *Journal of Rural Studies*, *34*, 204–211.

Lengen, C., & Blasius, J. (2007). Constructing a Swiss health space model of self-perceived health. *Social Science & Medicine*, *65*(1), 80–94.

Lin, A., Arnold, B. F., Afreen, S., Goto, R., Huda, T. M. N., Haque, R., … Luby, S. P. (2013). Household environmental conditions are associated with enteropathy and impaired growth in rural bangladesh. *American Journal of Tropical Medicine and Hygiene*, *89*(1), 130–137. https://doi.org/10.4269/ajtmh.12-0629.

Lin, N., Ye, X., & Ensel, W. M. (1999). Social support and depressed mood: A structural analysis. *Journal of Health and Social Behavior*, 344–359.

Lochner, K., Kawachi, I., & Kennedy, B. P. (1999). Social capital: a guide to its measurement. *Health & Place*, *5*(4), 259–270.

Luby, S. P., Agboatwalla, M., Feikin, D. R., Painter, J., Billhimer, W., Altaf, A., & Hoekstra, R. M. (2005). Effect of handwashing on child health: A randomised controlled trial. *Lancet*, *366*(9481), 225–233. https://doi.org/10.1016/S0140-6736(05)66912-7.

Luby, S. P., Agboatwalla, M., Painter, J., Altaf, A., Billhimer, W. L., & Hoekstra, R. M. (2004). Effect of intensive handwashing promotion on childhood diarrhea in high-risk communities in Pakistan: a randomized controlled trial. *JAMA : The Journal of the American Medical Association*, *291*(21), 2547–2554. https://doi.org/10.1001/jama.291.21.2547.

MacKinnon, D. P., & Dwyer, J. H. (1993). Estimating mediated effects in prevention studies. *Evaluation Review*, *17*(2), 144–158.

Maksimoski, N., & Waterkeyn, A. (2010). THE COMMUNITY HEALTH CLUB APPROACH IN INFORMAL SETTLEMENTS: CASE STUDY FROM ETHEKWINI MUNICIPALITY, KZN, SOUTH AFRICA. In *Water Institute of South Africa, Durban*. Durban: WISA.

Malebo, H. M., Massaga, J. J., Mshana, J. M., Senkoro, K. P., Lugimbana-Malebo, L., Nyoni, J., & Dillip, A. (2007). *Evaluation of Performance of Participatory Hygiene and Sanitation Transformation Strategy (PHAST) in Tanzania*. *National Institute of Medical Research, Government of Tanzania*.

McGranahan, G. (2015). Realizing the Right to Sanitation in Deprived Urban Communities: Meeting the Challenges of Collective Action, Coproduction, Affordability, and Housing Tenure. *World Development*, *68*, 242–253. https://doi.org/10.1016/j.worlddev.2014.12.008.

McMahon, S. A., Winch, P. J., Caruso, B. A., Obure, A. F., Ogutu, E. A., Ochari, I. A., & Rheingans, R. D. (2011). "The girl with her period is the one to hang her head" Reflections on menstrual management among schoolgirls in rural Kenya. *BMC International Health and Human Rights*, *11*(1), 7. https://doi.org/10.1186/1472-698X-11-7.

Meulman, J. J., Van der Kooij, A. J., & Babinec, A. (2002). New features of categorical principal components analysis for complicated data sets, including data mining. In *Classification, automation, and new media* (pp. 207–217). Springer.

Ministry of Public Health and Population. (2013). *National Plan for the Elimination of Cholera in Haiti 2013-2022*.

Mohan, G., & Mohan, J. (2002). Placing social capital. *Progress in Human Geography*, *26*(2), 191–210.

Mohan, G., & Stokke, K. (2000). Participatory development and empowerment : the dangers of localism. *Third World Quarterly*, *21*(2), 247–268.

Moore, S., & Kawachi, I. (2017). Twenty years of social capital and health research: a glossary. *Journal of Epidemiology and Community Health*. https://doi.org/10.1136/jech-2016-208313.

Moore, S., Shiell, A., Hawe, P., & Haines, V. A. (2005). The privileging of communitarian ideas: citation practices and the translation of social capital into public health research. *American Journal of Public Health*, *95*(8), 1330–1337.

Munyoro, M. (2016). *Effectiveness of podcasting in water, sanitation and hygiene (WASH) education: a case of Bindura town*. Midlands State University.

Murayama, H., Fujiwara, Y., & Kawachi, I. (2012). Social Capital and Health : A Review of Prospective Multilevel Studies, *22*(3), 179–187. https://doi.org/10.2188/jea.JE20110128.

Murta, J. C. D., Willetts, J. R. M., & Triwahyudi, W. (2018). Sanitation entrepreneurship in rural Indonesia: a closer look. *Environment, Development and Sustainability*, *20*(1), 343–359.

Ncube, K. (2013). *An assessment of the effectiveness of community health clubs as drivers of health and hygiene in Mzilikazi District, Bulawayo*. Midlands State University.

Ndayambaje Rwagitare, B. (2016). *Cost effectiveness analysis of community health programs in Rwanda: a case study of Rusizi district*. University of Rwanda.

Ngure, F. M., Reid, B. M., Humphrey, J. H., Mbuya, M. N., Pelto, G., & Stoltzfus, R. J. (2014). Water, sanitation, and hygiene (WASH), environmental enteropathy, nutrition, and early child development: making the links. *Annals of the New York Academy of Sciences*, *1308*(1), 118–128. https://doi.org/10.1111/nyas.12330.

Niaone, M., Bendjemil, S., Rosenfeld, J., & Berggren, R. (2016). Community Health Clubs for Water, Sanitation and Hygiene (WASH) improvement in Rural Burkina Faso. *Annals of Global Health*, *82*(3), 495–496. https://doi.org/10.1016/j.aogh.2016.04.352.

Olson, M. (1965). *The logic of collective action: Public goods and the theory of groups*. Massachusetts: Harvard University Press.

Ostrom, E., & Ahn, T. K. (2007). The Meaning of Social Capital and Its Link to Collective Action. *Research Paper No. 2008-11-04 The*, 1–34. https://doi.org/10.2139/ssrn.1304823.

Pan American Health Organization/World Health Organization. (2017). *Epidemiological Update - Cholera*. Washington, DC. Retrieved from http://www.paho.org/hq/index.php?option=com_docman&task=doc_view&gid=28070+&Itemid=270&lang=fr.

Peal, A., Evans, B., & van der Voorden, C. (2010). *Hygiene and Sanitation Software: An Overview of Approaches*. *Water Supply & Sanitation Collaborative Council*. Geneva, Switzerland: Water Supply and Sanitation Collaborative Council. Retrieved from http://link.springer.com/chapter/10.1007/978-1-4757-5793-4_6.

Pearson, J., & McPhedran, K. (2008). A literature review of the non-health impacts of sanitation. *Waterlines*, *27*(1), 48–61.

Person, M. T., Delea, M. G., Garn, J. V, Alexander, K., Abaire, B., & Freeman, M. C. (2017). Assessing the influence of social capital on water point sustainability in rural Ethiopia. *Journal of Water Sanitation and Hygiene for Development*. https://doi.org/10.2166/washdev.2017.167.

Portes, A. (1998). Social Capital: Its origins and applications in modern sociology. *ANNUAL REVIEW OF SOCIOLOGY*, *24*, 1–24. https://doi.org/10.1146/annurev.soc.24.1.1.

Potter, W. J., & Levine-Donnerstein, D. (1999). Rethinking validity and reliability in content analysis. *Journal of Applied Communication Research*, *27*, 258–284.

Prokopy, L. S., & Thorsten, R. (2008). The role of wealth, income, and social capital in determining a household's choice to participate in rural water-supply projects in Peru. *ENVIRONMENT AND PLANNING C-GOVERNMENT AND POLICY*, *26*(6), 1162–1176. https://doi.org/10.1068/c0725g.

Pruss-Ustun, A., Bartram, J., Clasen, T., Colford, J. M., Cumming, O., Curtis, V., … Cairncross, S. (2014). Burden of disease from inadequate water, sanitation and hygiene in low- and middle-income settings: A retrospective analysis of data from 145 countries. *Tropical Medicine and International Health*, *19*(8), 894–905. https://doi.org/10.1111/tmi.12329.

Prüss-Üstün, A., Bos, R., Gore, F., & Bartram, J. (2008). Safer water, better health. *World Health Organization*, 53. https://doi.org/ISBN 9789241596435.

Putnam, R. D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy*, *6*(1), 65–78.

Raphael, D., Renwick, R., Brown, I., Steinmetz, B., Sehdev, H., & Phillips, S. (2001). Making the links between community structure and individual well-being: community quality of life in Riverdale, Toronto, Canada. *Health & Place*, *7*(3), 179–196.

Richardson, G. P. (1994). Systems thinkers, systems thinking. *System Dynamics Review*, *10*(2-3), 95–99.

Richardson, G. P. (2011). Reflections on the foundations of system dynamics. *System Dynamics Review*, *27*(3), 219–243.

Rogers, P. J. (2008). Using programme theory to evaluate complicated and complex aspects of interventions. *Evaluation*, *14*(1), 29–48.

Rosenfeld, J. A. (2008). Incremental Improvements to Community Water Supply Systems through Community Health Clubs in the Umzimkhulu Local Municipality. In *Water Institute of South Africa, Durban*.

Rosenfeld, J., & Taylor, B. (2015). *Global Health in the Dominican Republic: Progress and Obstacles to Scale Up and Implementation of Successful Programs* (EDGS Working Paper No. 3). *EDGS Working Paper*. Chicago.

Russel, K., Tilmans, S., Kramer, S., Sklar, R., Tillias, D., & Davis, J. (2015). User perceptions of and willingness to pay for household container-based sanitation services: experience from Cap Haitien, Haiti. *Environment and Urbanization*, *27*(2), 525–540. https://doi.org/10.1177/0956247815596522.

Sabatini, F. (2009). Social capital as social networks: A new framework for measurement and an empirical analysis of its determinants and consequences. *The Journal of Socio-Economics*, *38*(3), 429–442.

Sampson, R. J., Morenoff, J. D., & Earls, F. (1999). Beyond social capital: Spatial dynamics of collective efficacy for children. *American Sociological Review*, 633–660.

Schuller, T., Baron, S., & Field, J. (2000). Social capital: a review and critique. In S. Baron, J. Field, & T. Schuller (Eds.), *Social capital: critical perspectives* (pp. 1–39). Oxford; New York: Oxford University Press.

Semple, K. (2018). U.S. and Canada Warn Against Travel to Haiti as Violent Protests Continue. *New York Times*. Retrieved from https://www.nytimes.com/2019/02/15/world/americas/haiti-travel-advisory.html.

Sevigny, B., Belanger, J. P., & Sullivan, R. (1999). Social capital and improvement in health and wellbeing of populations. CANADIAN PUBLIC HEALTH ASSOC 1565 CARLING AVE, SUITE 400, OTTAWA, ONTARIO K1Z 8R1, CANADA.

Shakya, H. B., Christakis, N. A., & Fowler, J. H. (2014). Association between social network communities and health behavior: An observational sociocentric network study of latrine ownership in rural india. *American Journal of Public Health*, *104*(5), 930–937. https://doi.org/10.2105/AJPH.2013.301811.

Sherpa, A. M., Koottatep, T., Zurbrügg, C., & Cissé, G. (2014). Vulnerability and adaptability of sanitation systems to climate change. *Journal of Water and Climate Change*, *5*(4), 487–495.

Shrestha, M. K. (2013). Internal versus External Social Capital and the Success of Community Initiatives: A Case of Self-Organizing Collaborative Governance in Nepal. *PUBLIC ADMINISTRATION REVIEW*, *73*(1), 154–164. https://doi.org/10.1111/j.1540-6210.2012.02622.x.

Sinharoy, S. S., Schmidt, W.-P., Wendt, R., Mfura, L., Crossett, E., Grépin, K. A., … Clasen, T. (2017). Effect of community health clubs on child diarrhoea in western Rwanda: cluster-randomised controlled trial. *The Lancet Global Health*, *5*(7), e699–e709. https://doi.org/https://doi.org/10.1016/S2214-109X(17)30217-6.

Sommer, M. (2010). Where the education system and women's bodies collide: The social and health impact of girls' experiences of menstruation and schooling in Tanzania. *J Adolesc*, *33*. https://doi.org/10.1016/j.adolescence.2009.03.008.

Sorenson, S. B., Morssink, C., & Campos, P. A. (2011). Safe access to safe water in low income countries: water fetching in current times. *Social Science & Medicine*, *72*(9), 1522–1526.

Stevenson, R. J., Case, T. I., Hodgson, D., Porzig-Drummond, R., Barouei, J., & Oaten, M. J. (2009). A scale for measuring hygiene behavior: development, reliability and validity. *American Journal of Infection Control*, *37*(7), 557–564. https://doi.org/10.1016/j.ajic.2009.01.003.

Stocks, M. E., Ogden, S., Haddad, D., Addiss, D. G., McGuire, C., & Freeman, M. C. (2014). Effect of Water, Sanitation, and Hygiene on the Prevention of Trachoma: A Systematic Review and Meta-Analysis. *PLoS Medicine*, *11*(2). https://doi.org/10.1371/journal.pmed.1001605.

Story, W. T. (2013). Social capital and health in the least developed countries : A critical review of the literature and implications for a future research agenda. *Global Public Health*, *8*(9), 983–999. https://doi.org/10.1080/17441692.2013.842259.

Szreter, S., & Woolcock, M. (2004). Health by association? Social capital, social theory, and the political economy of public health. *International Journal of Epidemiology*, *33*(4), 650–667. https://doi.org/10.1093/ije/dyh013.

Tilmans, S., Russel, K., Sklar, R., Page, L. N., Kramer, S., & Davis, J. (2015). Container-based sanitation: assessing costs and effectiveness of excreta management in Cap Haitien, Haiti. *Environment and Urbanization*, *27*(1), 89–104. https://doi.org/10.1177/0956247815572746.

United Nations. (2019). Sustainable Development Goals. Retrieved April 17, 2019, from https://sustainabledevelopment.un.org/?menu=1300.

UNOCHA. (2019). *Haiti Cholera figures as of January 2019*.

van der Cruijsen, C., de Haan, J., & Jansen, D.-J. (2016). Trust and Financial Crisis Experiences. *Social Indicators Research*, *127*(2), 577–600. https://doi.org/10.1007/s11205-015-0984-8.

Veenstra, G., Luginaah, I., Wakefield, S., Birch, S., Eyles, J., & Elliott, S. (2005). Who you know, where you live: social capital, neighbourhood and health. *Social Science & Medicine (1982)*, *60*(12), 2799–2818. https://doi.org/10.1016/j.socscimed.2004.11.013.

WASHplus. (2016). *Essential WASH Actions*. Washington, DC. Retrieved from http://www.washplus.org/sites/default/files/Essential WASH Actions.pdf.

Waterkeyn, J. A. (2006). *Cost Effective Health Promotion and Hygiene Behaviour Change through Community Health Clubs. Unpublished PhD Thesis, London School of Hygiene and Tropical Medicine*. London School of Tropical Medicine & Hygiene.

Waterkeyn, J. A., & Waterkeyn, A. J. (2013). Creating a culture of health: hygiene behaviour change in community health clubs through knowledge and positive peer pressure. *Journal of Water Sanitation and Hygiene for Development*, *3*(2), 144–155. https://doi.org/10.2166/washdev.2013.109.

Waterkeyn, J., & Cairncross, S. (2005). Creating demand for sanitation and hygiene through Community Health Clubs: A cost-effective intervention in two districts in Zimbabwe. *Social Science and Medicine*, *61*(9), 1958–1970. https://doi.org/10.1016/j.socscimed.2005.04.012.

Waterkeyn, J., Matimati, R., & Muringaniza, A. (2009). ZOD for all–Scaling up the community Health Club Model to meet the MDGs for Sanitation in rural and urban areas: Case Studies from Zimbabwe and Uganda. In *International Water Association Conference, Mexico City* (pp. 1–5). Mexico City.

Waterkeyn, J., Okot, P., & Kwame, V. (2005). Rapid sanitation uptake in the internally displaced people camps of Northern Uganda through community health clubs. In *31st WEDC International Conference Maximizing the Benefits from Water and Environmental Sanitation* (p. 4). Kampala. 31st WEDC Conference.

Waterkeyn, J., & Rosenfeld, J. (2009). Monitoring Hygiene Behaviour Change Through Community Health Clubs. In *International Water Association Conference. Mexico City* (pp. 1–12).

Webb, A. L., Stein, A. D., Ramakrishnan, U., Hertzberg, V. S., Urizar, M., & Martorell, R. (2006). A simple index to measure hygiene behaviours. *International Journal of Epidemiology*, *35*(6), 1469–1477. https://doi.org/10.1093/ije/dyl165.

Whaley, L., & Webster, J. (2011). The effectiveness and sustainability of two demand-driven sanitation and hygiene approaches in Zimbabwe. *Journal of Water, Sanitation and Hygiene for Development*, *1*(1), 20–36. https://doi.org/10.2166/washdev.2011.015.

WHO/UNICEF. (2015). *Progress on sanitation and drinking water: 2015 update and MDG Assessment*. *World Health Organization*. Geneva.

WHO. (2005). *Report of the Third Global Meeting of the Partners for Parasite Control: Deworming for health and development*. *World Health Organziation*. Geneva.

WHO, & UNICEF. (2017). *Progress on Drinking Water, Sanitation and Hygiene: 2017 update and SDG baselines*. Geneva. https://doi.org/10.1111 / tmi.12329.

Winters, M. S., Karim, A. G., & Martawardaya, B. (2014). Public service provision under conditions of insufficient citizen demand: Insights from the urban sanitation sector in indonesia. *World Development*, *60*, 31–42. https://doi.org/10.1016/j.worlddev.2014.03.017.

Wood, S., Foster, J., & Kols, A. (2012). Understanding why women adopt and sustain home water treatment: insights from the Malawi antenatal care program. *Social Science & Medicine*, *75*(4), 634–642.