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Determinants of Hand-washing with Soap: Evidence from Primary Schools in Bangladesh

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An abstract of
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Abstract

Determinants for Hand-washing with Soap: Evidence from Primary Schools in Bangladesh

By Loida C. Erhard

Background: More than 8.1 million children died before their fifth birthday in 2009, mostly from preventable and treatable causes. These child deaths are concentrated in low-income countries, with 34% of all deaths occurring in South Asia. Although Bangladesh has made considerable improvements in child health, many of these health problems persist. Research studies have shown strong evidence that hand washing with soap may greatly reduce the incidence of diarrheal disease and respiratory infection. However, there is little data on current hygiene practices in primary schools or the state of sanitation facilities in Bangladesh.

Objective: The specific objective of the study is to better understand and measure the current rate of hand washing with soap after latrine use in primary school children in Bangladesh. Additionally, this study aims to determine the physical and psychological constraints that affect students' hand washing behaviors.

Methods: Data from fifty participating schools were collected using quantitative methods. Water, sanitation and hygiene facilities of each school were assessed with a physical survey. Hygiene behavior after latrine use was measured by structured observations. Finally, four students and the head master from each school were surveyed to gather information on barriers to access of WASH facilities

Results: Overall, the assessment of school facilities found access to water to be adequate in most schools with 40 out of 50 schools possessing a water source on school property. Soap for hand washing was not found to be as easily available; approximately 50% of schools had soap for hand washing. Hand washing with soap was rarely practiced: 21% of 629 students observed after latrine use washed both hands with soap. Survey results from students and head masters illustrated the need for increased funding for soap and maintenance of sanitation facilities.

Discussion: Inconsistent availability of soap and water are major barriers for hand washing with soap with primary school children. Recommendations of increased funding, engagement of the community, and continued education in school hygiene programs can help address those issues. Further research is needed to fully understand the motivations for hand washing with soap among primary school children in Bangladesh.

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Table of Contents

Chapter 1: Introduction

1.1 Background

More than 8.1 million children died before their fifth birthday in 2009, mostly from preventable and treatable causes. These child deaths are concentrated in low-income countries, with 34% of all deaths occurring in South Asia (You, Jones and Wardlaw 2010). Multiple studies have shown that diarrheal disease and acute respiratory infections (ARI) are the leading causes of childhood deaths worldwide (Black, Morris and Bryce 2003). The high levels of mortality due to these infections can be directly associated to fact that one billion people lack access to improved water sources, and 2.5 billion do not have access to basic sanitation (Organization 2011). This problem leads to the lack of latrine use, poor hand hygiene, and ultimately the unavoidable consumption of contaminated drinking water. As a result, child mortality has remained unacceptably high, with child deaths dropping a mere 1.1% each year from 1990-2001 (UNICEF 2002). Although Bangladesh has made considerable improvements in child health with child mortality rates dropping from 62.3 per 1,000 in 2006 to 52 in 2009, these health issues still persist (You et al. 2010). The Bangladesh Demographic and Health Survey (BDHS) 2004 found that ARI and diarrheal disease were responsible for approximately 40% of deaths among children under five years of age.

Many child deaths due to diarrheal disease and ARI could be prevented through cost effective measures such as improved hand hygiene. Direct and indirect transmission routes via hand transfer of bacterial or viral pathogens that cause diarrheal disease and ARI can be effectively interrupted by practicing hand washing with soap. Meta-analysis of water, sanitation, and hygiene programs have found that hand washing with soap may reduce diarrheal disease by 42-49% and reduce the risk of respiratory infection by 16% (Curtis and Cairncross 2003, Rabie

and Curtis 2006). In areas where ARI and diarrheal disease are leading causes of childhood deaths, hand washing with soap is rarely practiced. For example, a study done in rural Bangladesh found through structured observation that only 18% of persons washed both hands with soap after contact with feces (Luby et al. 2009).

Numerous research studies have been conducted in Bangladesh to better understand hygiene behaviors and to improve current hand washing practices. However, the studies have primarily focused on the household level, and less is known about these practices in school settings. There is very limited literature on the hygiene behaviors of primary school children in Bangladesh. Recent studies conducted on hygiene practices in Bangladesh by the International Center for Diarrheal Disease Research, Bangladesh (ICDDR, B) and the Environment and Populations Research Center (EPRC) have concentrated on women in rural areas (Hoque 2003, Hoque et al. 1995b, Luby et al. 2009).

Helping in addressing this gap, the Bangladesh Department of Public Health Engineering (DPHE) and UNICEF have jointly implemented the Sanitation, Hygiene Education and Water Supply in Bangladesh (SHEWA-B) project from 2007-2011. This project aims to increase access to safe water, and improve sanitation and hygiene practices nationwide through implementing household and school interventions (IRC 2007). The SHEWA-B project has included intensive water, sanitation, and hygiene activities and uses community hygiene promoters to reach 30 million people including 1.5 million school children and is supported by the UK Department for International Development (DFID) and UNICEF. Intervention communities were selected based on criteria formulated by the DPHE as well as by the needs of the communities themselves. The overall SHEWA-B program has carried out different levels of

program components in the intervention communities. Software components include social mobilization activities, preparation of the Community Action Plan (CAP), hygiene promotional activities among others. The hardware component includes both water sources and sanitation facilities, which are implemented per local demand and technical feasibility.

The SHEWA-B school component has also received different levels of intervention. All participating schools in the program have received training for teachers and school management committees on sanitation and hygiene, along with curriculum and materials for the school sanitation and hygiene education programs. As of June 2010 the program has reached 8,412 primary schools in 68 upazilas, out of a total of 483 upazilas (counties). The project has aimed to provide new water, sanitation and hygiene facilities for 20% of schools in each project upazila, and repair existing facilities in an additional 20% of the project upazila. Currently, in 45 upazilas, approximately 10% of schools have received newly constructed water, sanitation and hygiene facilities and 8% of schools have repaired existing facilities.

1.2 Significance

The government of Bangladesh has made primary education free for all children in Bangladesh. Children between the ages of six and ten are required to attend school by law (Hossain and Jaha 1995). Although drop-out rates remain a challenge in the Bangladeshi school system, Bangladesh has successfully increased primary school enrollment rates to 87% of boys and 91% of girls (UNICEF 2010). There are currently 37,000 government schools in Bangladesh being attended by 12 million students (Ardt et al. 2005). With this success, there have been some challenges in providing adequate facilities for students attending schools. Figure 1.1 through 1.4 illustrates typical primary school settings in Bangladesh.

A baseline study was conducted by UNICEF before implementing the SHEWA-B program, and found a majority of primary schools in Bangladesh were in dire shape. Forty-seven percent of schools did not have a water source on the school property, and on average there was one latrine per 152 students, with the one school averaging 479 students per latrine (Barkat et al. 2010). These numbers are clear indicators of the level of improvement that is needed for there to be access to adequate sanitation and hygiene facilities for primary school children. Also, given the large numbers of children who are attending schools this is an important opportunity to reach children to improve hygiene behaviors and decrease disease incidence, which is too often missed.

Figure 1.1 Typical primary school classroom setting

Figure 1.2 Broken and abandoned school latrine

Figure 1.3 Typical school water source (tube well)

Figure 1.4 Inside a school latrine

This thesis project emerged from the 2009 midline evaluation of the SHEWA-B project conducted by the International Center for Diarrheal Disease Research, Bangladesh (ICDDR, B). This evaluation concluded that progress had been made in changing household level hygiene behaviors; however, not all of the objectives of the program were met throughout the duration of the project. Also, despite the large investment in time and resources provided by the SHEWA-B project, there was little known on the hygiene behaviors of primary school children. As a result, the SHEWA-B school study was created and implemented in order to further evaluate the current sanitation and hygiene situation in participating primary schools. It was not possible to characterize all hygiene behaviors of primary school children. From the five critical times recommended for hand washing, hand washing after defecation is considered to be the most important in terms of decreasing transmission of fecal-borne pathogens that cause diarrheal disease. Therefore, the study focused primarily on hygiene behavior after defecation in schools. The findings from these studies will be used to help focus the strengths of the program and

suggest areas for improvement. With little research conducted on hygiene behaviors in schools overall, this information will be useful for future interventions at the school level.

The goal of the overall SHEWA-B project is to contribute to achieving the Millennium Development Goals for Bangladesh by improving access to adequate sanitation and hygiene. Within the overarching goal, this research study aims to assist the SHEWA-B program in one specific area by characterizing hygiene practices, particularly hand washing with soap in primary school children in Bangladesh.

1.3 Study Objectives

The specific objective of the study is to better understand and measure the current rate of hand washing with soap after latrine use in primary school children in Bangladesh. Additionally, this study aims to determine the physical and psychological constraints that affect students' hand washing behaviors.

Chapter 2: Literature Review

2.1 School WASH Programs

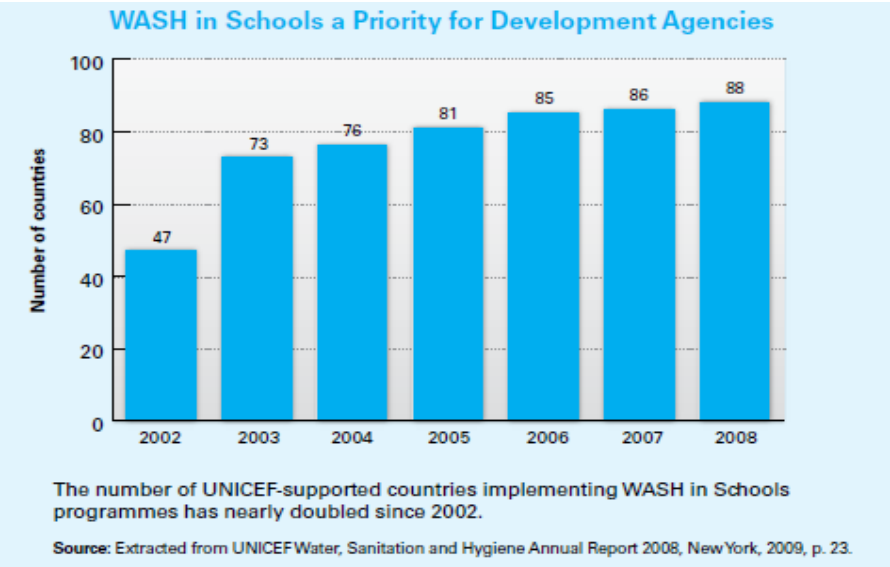
The growing interest in school-based WASH programs has led to a considerable increase in the number of programs implemented in low-resource countries (UNICEF 2009). Figure 2.1 illustrates this growth, by showing the increase in UNICEF country offices supporting WASH in schools, which has expanded from 47 in 2002 to 88 in 2008. The existing school WASH programs have shown promising results. Multiple studies conducted on recent school WASH programs have shown a decrease in school absenteeism as well as increased hand washing and sanitation practices (O'Reilly et al. 2008b, Bowen et al. 2007, UNICEF 2009). A study in rural Kenya evaluating the impact of a school-based safe water and hygiene program found that the program reduced student absenteeism by 35% (O'Reilly et al. 2008). At this time there is no concrete evidence on what components of these programs are the most effective, which lends to the conclusion that more research needs to be done in this area (IRC 2009).

Considering that children age 5-11 spend a substantial amount of time in a school setting, it has become an ideal venue to educate and introduce proper water, sanitation, and hygiene practices. Schools are fitting sites for conveying hygiene messages for a number of reasons (UNICEF 2009). Outreach in schools is a great opportunity to reach and influence a large quantity of children at one time when they are in a learning environment. For example, O'Reilly et al. found that student's knowledge of critical times of hand washing increased approximately 20% from baseline to final evaluation, and concluded that students are important targets for health and hygiene interventions (O'Reilly et al. 2008). Many school programs have also revealed that children are potential facilitators in not only improving their own hygiene

practice, but in their families and communities by encouraging proper hand washing behaviors in their homes (Onyango-Ouma, Aagaard-Hansen and Jensen 2005, Yeaw et al. 2003).

Additionally, with disproportionate numbers of children packed into one location, classrooms provide the opportunity for efficient transmission of infectious agents. Without access to proper sanitation and hygiene facilities, illness can spread quickly among students and can extend into the community (Heymann et al. 2004). Therefore, WASH programs have the potential to play a critical role in the abatement and prevention of diarrheal and respiratory illness in the community. The impact of these programs may also contribute to increased student learning due to the decrease in school absenteeism.

Figure 2.1 Number of Countries with school WASH programs



2.1.1 School WASH Hardware Components

Established school WASH programs have generally included the three main components of improved access to safe water, increased sanitation efforts, and hygiene education, with a

focus on hand washing with soap. However, in low-resource settings programs can vary considerably on how they are carried out and maintained depending on resources and environmental conditions. According to some researchers in the field**,** in order to be effective, school programs must address all critical aspects of water, sanitation, and hygiene to be successful (Eisenberg, Scott and Porco 2007). This claim has not been backed by substantial evidence, and further studies must be completed to investigate the most effective components of a school WASH program.

Access to safe water in schools for drinking and practicing proper hygiene is one of the most crucial aspects of any school WASH program. Water supply and quality are most commonly addressed through provision of new water sources, such as a tube well, hand pumps, piped water from city or municipal water system, among others. Water quality issues can be approached by either chemical or physical treatments that are available for improving the microbial quality of water and reducing waterborne infectious agents (WHO 2007, CAWST 2009). The numerous methods for treatment include boiling, filtration, chlorination, solar disinfection, and flocculation-disinfection. These methods are the most well known and popular proven water treatment options (WHO 2011).

Sanitation programs generally consist of building or repairing improved latrine facilities. The World Health Organization (WHO) defines improved latrines as facilities that have connection to public sewers, septic systems, pour-flush latrines, simple pit latrines, and ventilated improved pit latrines. Unimproved sanitation services include bucket latrines (where excreta is removed manually), public latrines, and open latrines.

Lastly, the hygiene component of the program includes education on the use of sanitation facilities, and proper hand washing practices with soap at the five critical times. The educational piece gives students background knowledge on why these practices are important and how to apply them properly in their everyday lives.

2. 1.2 Hygiene Education Components

Regardless of structural improvements, school WASH programs will be more effective when there is a multiple pronged approach is taken, to eliminate all transmission pathways (Eisenberg et al. 2007). Hygiene education plays a large role in facilitating improved hand hygiene practices in schools. Unfortunately, behavior change in hand washing practices has been difficult to establish, retain, and measure (Biran et al. 2008). There has been some debate on how hand hygiene should be taught in schools and in community settings.

Currently, the most commonly recommended hand washing technique is the six step procedure promoted by the International Scientific Forum on Home Hygiene (IFH). The IFH is an international non-profit organization which has the primary objectives to promote health and wellbeing through improved hygiene in the home and community. IFH was established in 1997 and works with universities and international organizations such as ICDDR, B to provide hygiene practice recommendations based on scientific evidence. The IFH recommended six steps hand washing method, include:

IFH 6 Step Hand Washing With Soap (HWWS) Technique

1) Use warm running water and preferably a liquid soap.

2) Apply a small quantity of soap to the hands.

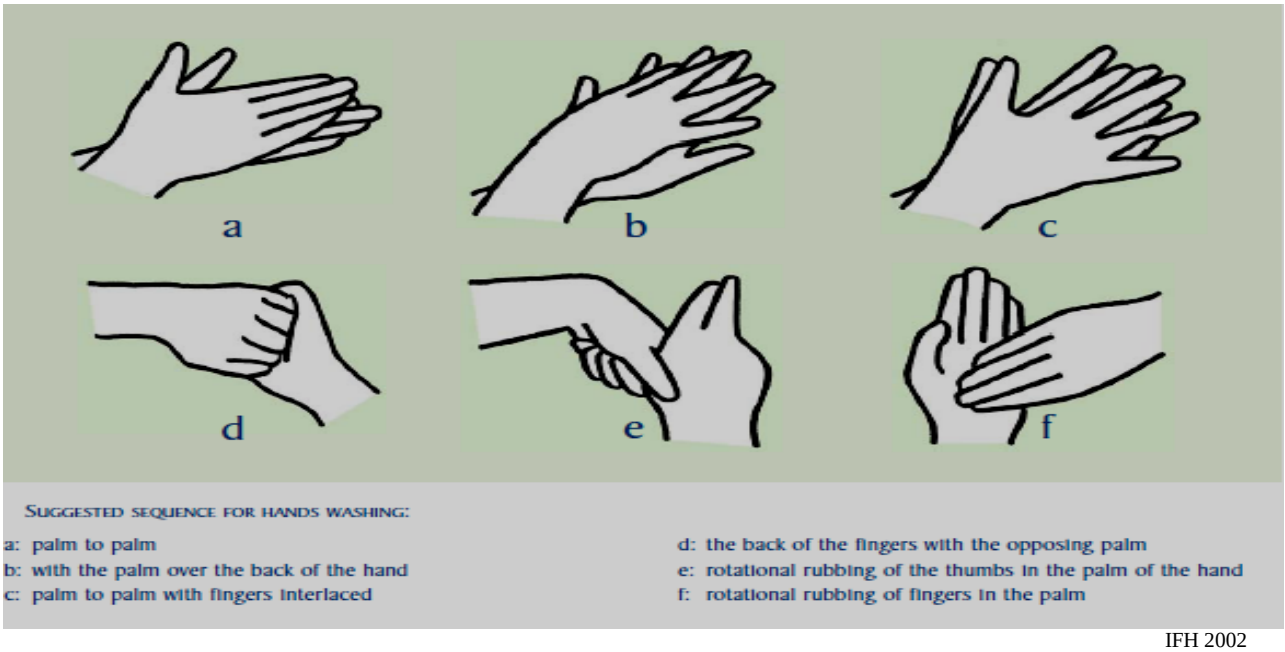
3) Rub hands together vigorously, and ensure soap and water is applied to all surfaces of the hands. Be sure to scrub between fingers, under fingernails and around the tops and palms.

4) Rinse hands under running water. Leave the water running while drying hands.

5) Dry hands with a clean towel or air dry

6) Turn the tap off. Wherever possible try to avoid touching the tap directly with washed hands since there is the possibility of recontamination (for rigorous hygiene, the tap should be turned off using a disposable paper towel).

Figure 2.2: Hand Washing Technique Visual Aid



IFH 2002

The IFH hand washing method above is evidently directed towards high-resource settings, and can be modified for a low-resource context. Adjustments such as substituting detergent, ash, or mud for liquid soap, and air drying hands instead of drying hands with a clean towel are more relevant for developing countries.

These hand washing directions have also been subject to criticism due to their length and complexity. Studies done in India and Bangladesh have shown increased hand washing behavior when using the IFH hand washing technique; however, the researchers felt that the number of steps should be minimized and the instructions made less complicated so that it could be followed by children and illiterate persons (Ray, Zaman and Laskar 2010, Ray et al. 2006).

Consistent hand washing with soap is not practiced even in wealthy countries. One study found that only 32% of males in the United Kingdom and 64% of females washed their hands with soap after using the restroom (Judah et al. 2009). In addition, many studies have found that in populations that do wash their hands, hand washing with water alone is practiced more often than hand washing with soap (Scott et al. 2007, Biran, Tabyshalieva and Salmorbekova 2005, Halder et al. 2010). Therefore,(Burton et al. 2011) decided to confirm the long held belief that hand washing with soap is more effective at reducing fecal bacteria associated with diarrheal and respiratory illness than using water alone by completing a proof-of-principle trial. The study concluded that hand washing with non-antibacterial soap and water was more effective than using only water, and thus should be promoted for removal of bacteria and prevention of diarrheal disease. However, the study also showed that hand washing with only water considerably reduced bacteria on study participants' hands. Specifically, the presence of fecal bacteria *Enterococcus* spp and *Enterobacter* on participants' hands was reduced from 44% of samples with no hand washing to 23% with those washing with water alone and to 8% among those who washed with soap and water (Burton et al. 2011).

Additional studies have also found that the use of soap, ash, and mud may also be an effective alternative to soap for reducing bacteria on hands after defecation when soap is unavailable (Hoque and Briend 1991, Hoque 2003). In low income countries soil, mud, and ash

are frequently used as the main hand washing agent. In the context of communities where affordability of soap is limited, alternatives to soap can be effective strategies in hand hygiene programs (WSP 2009). A study performed by Hoque et al. (1995a) in semi-rural Bangladesh found that out of 90 women who were observed after defecation, 38% used mud, 2% used ash, 19% used soap, and 41% used only water for hand cleansing. Of the women who did not use soap, 81% stated that they may have used soap if they could afford to buy it Hoque et al. (1995a). Further research by Hoque (2003) in Bangladesh found under controlled experimental conditions, using mud and ash effectively reduced bacteria counts on hands as well as soap. Moreover, they concluded that the friction made during hand washing, washing of both hands, and the amount and quality of water used were the highest determining factors of reducing bacteria on hands. This determination was identified through obtaining bacteriological samples from study participants and measuring the level of fecal coliform colonies found each hand (Hoque 2003).

There is still debate over the use of soil and ash as hand washing agents due to the fact that these materials themselves can be contaminated with infectious pathogens and may possibly cause disease (Bloomfield and Nath 2009, Hoque 2003). This data is evidence that in settings where soap is unavailable, hand washing practices with only water and other hand cleansing substances can still be substantially effective, but that the gold standard for hygiene programs is hand washing with soap.

In a more cultural context, (Hoque 2003, Hoque et al. 1995a) discovered that in rural Bangladesh a common form of anal cleansing is performed by rubbing the left hand on the ground and rinsing it with water, as well as using soil to rub hands together and rinse with water. Hoque argues that the strength of cultural patterns and religious beliefs strongly influence hygiene behaviors. Particularly in South Asian countries such as Bangladesh, cleanliness is

directly associated with Islamic beliefs and practices. The act of washing only the left hand is seen predominantly in Muslim, Buddhist and Hindu populations because of a shared belief in using the left hand for anal cleansing and the right for eating (Hoque et al. 1995b). Further studies are needed to fully understand the cultural context, and the type of hand washing instruction and materials that would be the most effective in developing country settings.

Critical Times to Wash Hands

Organizations such as IFH, WaterAid, and others have focused hand washing efforts on five critical times to wash (Ahmed and Begum 2008, IFH 2009). The five critical times: after defecation (disposing of human or animal feces), before eating food or feeding children, after cleaning a child's bottom (changing a baby's diaper), immediately after handling raw food (e.g. chicken, red- meat), and before handling cooked or ready- to-eat food (IFH 2009). Recently, there also has been increased discussion regarding the given instructions in hygiene programs on the number of critical times to wash hands. Researchers are concerned that if there is an excess of 'critical times' to wash, targeted populations will not be able to fulfill these requirements, especially in areas with limited water access and resources. It has been suggested that hand washing with soap should be recommended as primary barrier (to remove fecal matter after contact with stools) rather than also as a secondary barrier where hand washing is performed before preparing food, feeding, and eating (Curtis, Cairncross and Yonli 2000a).

This point is made more clear by a study completed in Guatemala which found that by asking mothers to wash their hands at each of the five critical times each day plus before going to bed required an additional 20 liters of water and an extra hour per day to wash on average 32 times (Curtis et al. 2000a). The limitation of minimal access to water and cost of soap will limit

the number of times hand washing can be promoted, and therefore it is necessary for research to be concentrated on determining which of the five critical times of hand washing will have the most effective health benefits and to disseminate that information in hygiene programs.

2.2 Hand Hygiene Promotion: Behavior Change

Behavior change messages have shown potential to motivate hygiene behavior in past interventions (Curtis, de Barra and Aunger 2011, Judah et al. 2009, Scott et al. 2007, Porzig-Drummond et al. 2009). One recent study by (Porzig-Drummond et al. 2009) reported that a disgust-based intervention was more effective than an education-based messaging at increasing rates of hand washing with soap. However, these findings were based on experimental conditions and only investigated disgust as a motivator for hand washing.

The task of determining the most effective motivators can be exceedingly difficult. To change ingrained, culturally-established behaviors such as hand washing involves a great deal of background knowledge and research on the population of interest and an understanding of the motivators for this specific behavior. When implementing a hygiene program, the first questions generally asked to understand hand washing practices are: What are the current hand washing practices? Who are the target audience segments for hand washing? Why do they not practice hand washing with soap? And how do we best reach the target audiences (Curtis, 2007)? From these questions, researchers attempt to develop the determinants and motivators of hand washing. Low rates of hand washing practice in populations that have received hygiene education are evidence that increased knowledge does not always translate into proper practices (Curtis et al. 1993). In response, researchers have brought attention to using commercial marketing

techniques in order to invoke an emotional response to the behavior instead of educational messages (Scott et al. 2008, Scott et al. 2007).

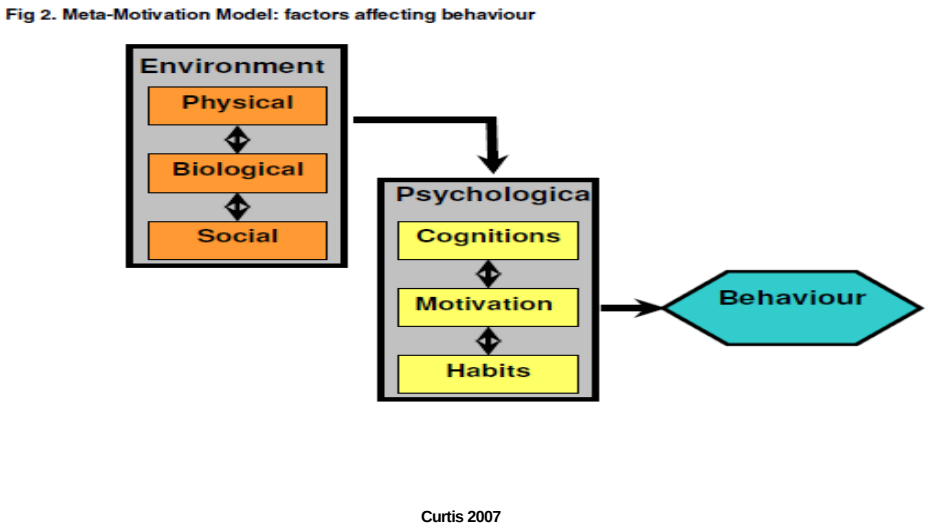
An evaluation of the Hohoro Wonsa/'Truly Clean' National Hand Washing Campaign in Ghana found the greatest increase in reported hand washing with soap (30%), after using the toilet or cleaning a child's bottom resulted from exposure to the media campaign on the radio or TV along with a community based activity. The results show that community education still can be effective, but may work better in conjunction with other marketing techniques. This study also found that health education such as disease prevention were not strong motivators for practices hand hygiene (Scott et al. 2008).

Previous studies have demonstrated that hand washing motivators vary considerably between populations and gender (Judah et al. 2009). However, overall the most effective messages are targeted on the domains of: fear of contamination (disgust), comfort, norms or affiliation, desire to care for their children (nurture), and being seen as dirty or unattractive (fear/shame) (Judah et al. 2009, Scott et al. 2008, Curtis, Scott and Cardos 2000b). These particular motivators for hand washing were found in studies focused solely adult behavior change so it cannot be directly associated with motivations of children or students.

A study done by the Innocenti Research Center (IRC, Netherlands) gained an in-depth understanding of motivators and barriers to hand washing at the community level and in primary schools in Kenya. The findings indicated that the main motivators for hand washing given by primary school students were: justification (the need to wash off germs that cause disease), fun (washing hands with soap was a form of play), and lastly, fitting in (hand washing is the accepted code of conduct in school). The presence of other children washing their hands was also

found to be a trigger for hand washing (IRC 2009). There are few studies specifically on hygiene behavior change in child or student populations, so more research needs to be done in this area to gain a better understanding of this behavior. Psychological motivations for hand washing are as important as environmental factors when considering behavior change components of hygiene programs. Both must be in place in order to successfully implement change in hygiene behaviors. [Figure 2.3]

Figure 2.3 Meta-Motivation Model: Factors Affecting Behavior



2.3 Measuring Hand Hygiene Behaviors

While influencing behavior change in hygiene behaviors can be difficult, measuring whether or not there has been adoption of the behaviors can be even more problematic. At this current time there are no affordable, easy, and reliable measures of whether or not hands have been washed with soap. Methods that have been employed to evaluate hygiene behavior are environmental spot checks of water or soap availability, access in appropriate locations, demonstration of hand washing practice, self-reported questionnaires, microbiological indicators, using bars of soap with motion sensors, and structured observation. The direct measurement of

health benefits such as the decrease in diarrheal or respiratory disease can also be an indicator for improved hand hygiene. However, this method does not allow the knowledge of what particular aspect of the program has affected health benefits, which is a crucial part of evaluating hygiene programs (Cairncross 1990).

Microbiological Indicators Measures

Microbiological indicators can be used as an objective proxy measure of hand washing behavior. Given this method, there is the assumption that hands that have been washed with soap will have a decreased amount of bacterial contamination when compared to hands that have not been washed with soap. Specific techniques include enumerating fecal streptococci using a finger impression technique, and wet NaCl-soaked charcoal swabs taken from contaminated hands have been used in research studies (Burton et al. 2011, Pinfold and Horan 1996). The samples were then taken to a laboratory to determine the amount of pathogens that were isolated. Experience in the field have found that to detect bacterial contamination on hands can be impractical and expensive to use in low-resource settings, and it cannot distinguish specifically when the hands were washed in terms of the critical times for hand washing (Pinfold and Horan 1996).

Structured Observation

Structured observation is the direct observation of a specific behavior of interest that is recorded by the researcher, while attempting to not influence this behavior. This method is established as the most reliable and valid method for measuring hand washing behaviors (Biran et al. 2008, Cousens et al. 1996, Curtis et al. 1993). Curtis and Cousens both performed studies investigating the reliability, and repeatability of structured observations and gathered that

structured observation is most reliable when describing population level behavior and not at a household level (Cousens et al. 1996, Curtis et al. 1993). Even though structured observation has been determined to be the most valid method for measuring hygiene behavior, it is not without drawbacks. Structured observation is expensive and labor intensive because it requires numerous trained field workers and staff. Field workers may also be unable to accurately document hand washing after defecation in the latrine due to the fact that they cannot observe the specific action of the study participant. Furthermore, observed behavior can be influenced by the presence of the field worker, and different cultures may be more or less accepting of this research technique than others (Biran et al. 2008).

The concept of "reactivity"; where a study participant may at first make a substantial effort to practice proper hygiene in front of the observer, but over time reverts back to normal behavior because they have become used to the presence, has been the impetus to create other observation methods (Curtis et al. 1993). For example, video observations have become a new and growing area of behavior measurement. A video camera is given to a person within the community and they record the behavior in a particular household for an entire day. This also comes across problems of video editing and analysis, but is an innovative and interesting technique that could be successfully used for accurate measurement of hygiene behavior.

Self Report

Self report is an economical, straight forward method for obtaining information on behavior. Although, self report of hand washing behavior in questionnaires show heightened and exaggerated rates when compared to direct observation methods (Cousens et al. 1996). This response can be partly explained the phenomenon seen in many research studies of social

desirability bias, where study participants want to please the researcher and give the 'right answer' (Ram, 2010). According to Biran et al (2008) there is considerably poor consistency between reported hygiene behavior and observed behaviors. Specifically, the study report kappa scores of 0.11 and 0.10 for reported and observed measures of hand hygiene behavior (Biran et al. 2008). With this information, it is clear that self report of hand washing behavior is not truly accurate and should not be used alone as the primary measure of hygiene behavior.

Soap with Motion Sensors

New technology of bars with motion sensors has been developed for measuring hygiene behaviors by the global corporation Unilever. This method has the potential to provide an objective measure of the number of hand washing events. It can be used to detect differences between before and after a program has been implemented or between study groups. Additionally, this measurement technique is not cost effective due to the new technology and has not been thoroughly tested in field settings. The information that is collected from the motion sensors will not inform researchers regarding the rates of hand washing with soap at critical times, but only the number and timing of soap use. Despite these issues, bars with motion sensors have great potential in objectively measuring hand washing behavior and should be evaluated further (Ram, 2010).

There are no perfect methods when trying to assess hand washing behaviors, but it is important to acknowledge these limitations and try to practice the most rigorous research methods. When looking at the big picture, the main purpose of assessing hand washing behavior is to gain a greater understanding of current hand washing practice, evaluating the success of implemented hygiene programs, and ultimately trying to improve levels of proper hand hygiene.

Through further research more accurate measurement tools will be available to improve these methods.

2.3 Examples of Current School WASH Programs

Sanitation, Hygiene Education and Water Supply in Bangladesh (SHEWA-B)

There are numerous school WASH programs that have been or are being currently implemented in countries all over the world. First and foremost, the program that is the focus of this thesis manuscript is the Sanitation, Hygiene Education and Water Supply in Bangladesh (SHEWA-B) Program. SHEWA-B is being implemented by the Government of Bangladesh and UNICEF, in collaboration with the UK Department for International Development (DFID). This program is attempting to reach 30 million people by improving hygiene practices and access to adequate sanitation facilities. Components of the program include community action, household level programming, and school based projects. The in depth description of the SHEWA-B school WASH program methodology will be explained in further detail in the methods chapter. The long term goals of the SHEWA-B Program is to change and influence the national water, sanitation, and hygiene policies for sustainable and long lasting effects (IRC 2007, ICDDR 2008).

School Sanitation and Hygiene Education (SSHE)

Secondly, the School Sanitation and Hygiene Education (SSHE) Program is a program that was implemented by the Government of India through the Restructured Central Rural Sanitation (RCRSP) and Total Sanitation Campaign Programs. The program includes a physical improvement component and a hygiene education component.

The Physical Component includes:

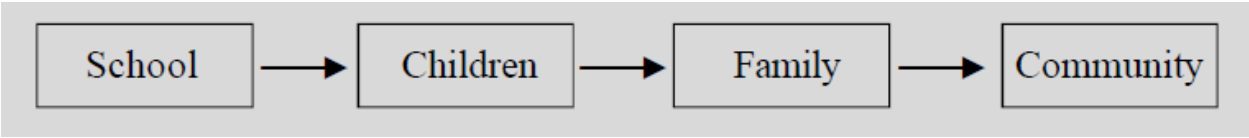
1. Construction of water supply points and storage facilities

2. Construction of toilet complexes with hand washing facilities
3. Construction of drainage system for washed water and urinals
4. Garbage pit

The Software/Education Component includes:
1. Institution Building
2. Training and capacity building of teachers
3. Health and hygiene education to children
4. Health check up and de-worming of children
5. Operation and maintenance of the water supply and sanitation facilities created in school
6. Monitoring of the program

SSHE is a comprehensive program that is aspiring to ensure access to child-friendly water supplies, toilet and hand washing facilities in all participating schools and promote behavioral change by hygiene education. The main aims of the program are to not only increase student's knowledge and awareness of proper sanitation but to utilize children as 'agents of change' by encouraging proper hygiene practices at home and in the community (Snel, Ganguly and Shordt 2002).

SSHE Framework



UNICEF, 2009

However, the program had mixed levels of success in the participating schools. A case study in the Gaya District of Bihar, India was performed to determine the characteristics of successful school SSHE programs and found that availability and accessibility of reliable sanitation facilities, as well as motivated school faculty were the main elements for

accomplishing the project aims (Yeaw et al. 2003). The case also revealed promising results from the program. Approximately 87% of students surveyed reported telling family members about the hygiene education that they learned in school. Additionally, there was an increase seen in female and male student enrollment and attendance since the introduction of the SSHE program (Yeaw et al. 2003).

School Led Total Sanitation (SLTS)

The School Led Total Sanitation (SLTS) program was developed from the School Sanitation and Hygiene Education (SSHE) program. This program originated from UNICEF Nepal where accomplishments from SSHE brought about the awareness of the power of supporting children as change agents. SLTS focuses primarily on empowering children to promote open defecation free areas in school and in the community (Adhikari and Shrestha 2008).

The five specific SLTS objectives are:

1. 100% coverage of latrines in the program intervention areas and eradication of open defecation.
2. Enhance personal (focusing on hand washing with soap), household and environmental hygiene and sanitation facilities and behaviors.
3. Empower children in development activities, thereby enhancing their personality and leadership.
4. Increase ownership of school and community in hygiene and sanitation activities.
5. Maintain sustainability of hygiene and sanitation facilities and behaviors through school-community partnership

Nepal has seen great success with the program, using motivational tools and participatory approaches to reach approximately 300 schools. As of 2008, 75 of the participating schools are Open Defecation Free (Adhikari and Shrestha 2008).

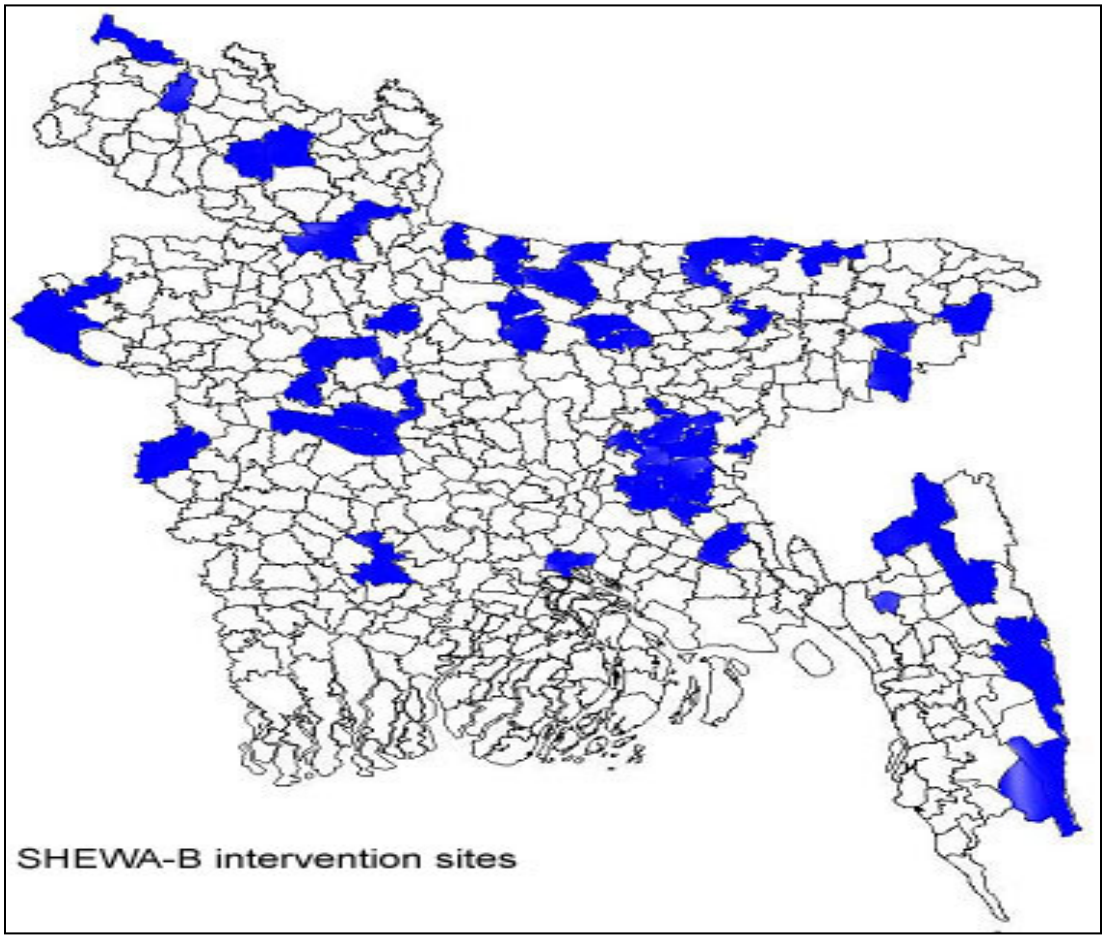
Each one of the school-based WASH programs has taken on different aspects of school water, sanitation and hygiene programs. As the programs progress, the findings can be used to enhance and further develop more effective school WASH programming.

Chapter 3: Methodology

3.1 Study Site & Population

As discussed in the previous chapter, the Sanitation, Hygiene Education and Water Supply in Bangladesh (SHEWA-B) program is being implemented by the Government of Bangladesh and UNICEF, with support from DFID. The focus of the project is on improvements in sanitation, safe water use, and hygiene practices. SHEWA-B has been carried out at a national level in selected intervention communities and implemented in 68 sub-districts (upazilas) out of 483 nationwide in Bangladesh since 2007.

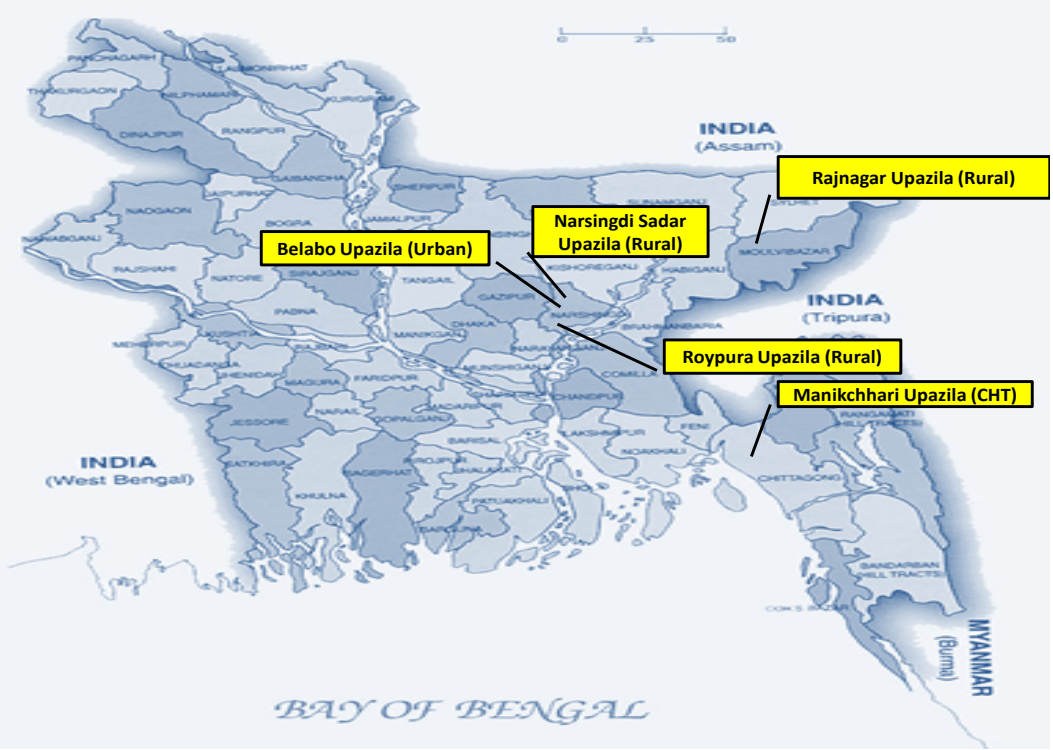
Figure 3.1 SHEWA-B Intervention Sites



ICDDR,B 2011

Bangladesh is noted for its cultural and geographic diversity. Within the country there is a significant tribal population which lives primarily in rural settings, communities that live on river islands (char-dwellers), and of course the immense numbers living in urban Dhaka. Considering these differences in geographic and socioeconomic conditions within Bangladesh, five participating upazilas were selected for this study to include these distinctions between cultural subgroups, topographies, and geographies. The study was implemented in five different geographic locations, which included one upazila from the Chittagong Hill Tracts, one urban upazila, and three rural upazilas. However, during the data collection process within the first rural upazila, Kamalganj in the Moulvibazar District, the local education officials became aware of our visit. Once the field researchers arrived at the schools it became apparent that there had been changes made to the usual water, sanitation, and hygiene facilities. In response to this issue a third upazila was chosen in the Narsingdi district, and data collected from Kamalganj was not included in the data analysis. Figure 3.2 illustrates the five specific locations chosen for this study and the different topographical and geographical differences. A total of fifty primary schools that participated in the SHEWA-B intervention were included in the study.

Figure 3.2 Map of Study Site Locations within SHEWA-B Program Areas



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The schools included in the study differed by level of the program implementation, socioeconomic level, and structure. The different levels of program implementation included training of all teachers and school management committee members on sanitation and hygiene education; health education curriculum materials; funding to repair existing water, sanitation, and hygiene (WASH) facilities' and funding for new latrines and water source facilities. Every school received training for school staff and education materials, but only 20% of participating schools were planned to receive additional funding for repairing or purchasing new items.

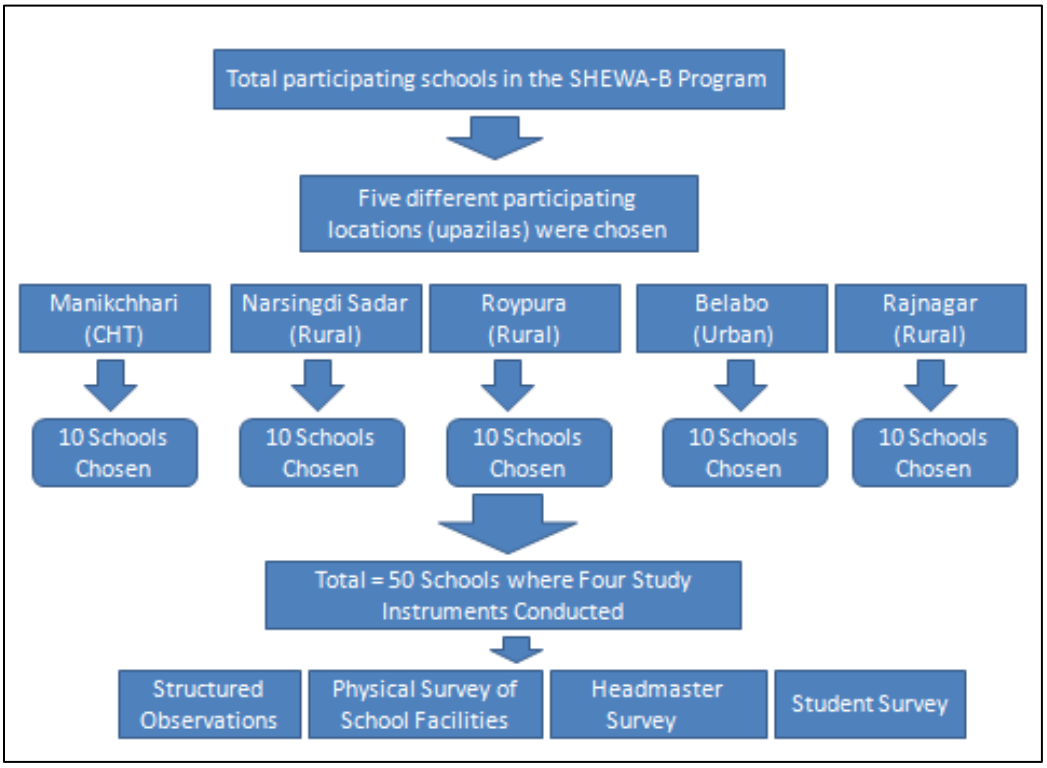
Although the upazilas were chosen purposefully, the schools within each location were randomly selected. Each upazila ranged in total area, generally varying between 160 km² to 450 km². The assumption was made that schools within each upazila were similar on levels of socioeconomic status. This assumption was backed by the fact that each upazila was in a

relatively small area, and the economic wealth of households was known to be similar from the original evaluation study conducted by ICDDR, B.

3.2 Sampling Methods

A sample size of 50 schools was determined upon the study objectives, time frame, staff availability and budget. Ten schools were chosen from each of the five selected upazilas. Figure 3.3 below demonstrates the process of study methodology. A list of all of the unions (towns) contained in each upazila was obtained, and one union was randomly selected using a random number generator. Field researchers were instructed to visit all schools within the union if there were ten or less schools residing in the union. However, if the union contained more than ten schools the field researchers started from the center of the union, which was generally where the town government office was located, and visited schools counterclockwise around the center until ten schools were sampled. When there were less than ten schools in the union, the field researchers went to the union directly adjacent and started again from the union center.

Figure 3.3 Study Methods Flow Chart



3.3 Study Procedures

Four data collection instruments were implemented for the study at each of the chosen participating schools. First, we observed primary school students for three hours during normal school hours to capture their current hand washing behaviors. Secondly, in order to determine the ability for students to wash their hands with soap at schools, a physical survey of each of the schools' facilities was conducted. Thirdly, students were interviewed to assess the students' perspectives on their school's WASH program. Lastly, the head master interview was conducted to determine the SHEWA-B program adherence, motivation, and perceived barriers to adopting hand washing with soap. The structured observation was conducted unobtrusively and all data were collected during an unannounced visit.

3.4 Instrument Design

The data collection tools were created with collaboration from water, sanitation, and hygiene experts from UNICEF, ICDDR,B, and The London School of Hygiene and Tropical Medicine. The study instruments were designed based upon the SHEWA-B projects objectives stated above. The physical survey was approximately four pages, and contained questions regarding the availability and condition of WASH facilities at each school. Particular focus was given on the number, usability, and type of latrines in schools. The structured observation instrument consisted of a table in which the field research assistants (FRAs) could check off the hygiene behavior practiced by each student who used the latrines. The behaviors that were captured in the survey were: hand washing with soap, hand drying techniques, and open defecation. The head master and student surveys both included sections on what each believed are the largest barriers for students to practice proper sanitation and hygiene behaviors. Additionally, the head master survey included questions regarding any initiatives they may have taken to improve the school WASH program, and gauge their involvement and motivation.

The field team included 10 FRAs and one field research officer (FRO) as the supervisor. Each of the FRAs had previous experience in data collection and research study methodology. FRAs were given a week long training session at the ICDDR,B center on the study protocol and guideline, and mock sessions were held during training to prepare for field work. To secure cooperation in the upazilas/paras in the Chittagong Hill Tracts the field team included members from these tribal communities. The data collection tools were piloted in a neighboring district and refined for the final study.

3.5 Data Collection

The field team visited each upazila and completed the study activities in ten schools per day with one FRA for each school. Permission for entry into the schools was obtained through a letter from the Divisional Primary Education Office allowing access to specific upazilas. The letter was shown and explained to the head master upon arrival at each school and a written consent process was then conducted with the head master. If the head master was not available the consent was taken from the acting head master.

Structured Observation Survey

The structured observation was conducted after the introduction and consent of the head master. The activity was described to the school staff as a simple observation of the school grounds. Structured observation was held at each of the fifty schools from 11:00 AM until 2:00 PM. This time frame was selected in order to capture hygiene behavior during the school break period as well as when students arrived for the second shift. Students are most likely to have a restroom break and use the latrine facilities at this time. Forty-eight out of the fifty schools had at least one functional latrine. Schools without a latrine did not include structural observations. The FRA was instructed to sit in an unobtrusive location with a clear view of the latrine facilities and hand washing location, but not to sit too close to the facilities as to arouse suspicion on what area was being observed.

Observations focused on the gender of the student, whether they washed their hands or not, with or without soap, and hand drying methods. The FRA only recorded hand washing of students who they saw used the latrine facility and did not record hand washing behavior for other reasons. Open defecation was only recorded if directly observed, and hand washing was documented for this behavior. Figure 3.4 is a depiction of an area where a FRA may sit to

observe hand washing behavior, and Table 3.1 below includes the spread sheet that was used by field researchers to document hygiene behaviors.

Figure 3.4 A Typical Location for Structured Observation

Table 3.1: Structured Observation Spreadsheet

Time of observation	**Sex**	**Did wash hands?**	**Did wash both hands?**	**Hand washing materials**	**Hand drying**	**Place of hand washing**	**Source of water for hand washing**	**Did you observe any open defecation**
11-12……..1 12-12.30…2 12.30-1.30..3 1.30 -2.00..4	Male…. ..1 Female ….2	Yes..1 No…2 Not possible to observe.. 3	Yes..1 No…2 Not possible to observe…. .3	Soap …. ….1 Ash/mud..2 Water only.. 3 Not possible to observe..4 Other……9	Air…1 Not dried..2 Clean towel….3 Dirty towel……4 clothe that is wearing…5 Others …9	School corridor……..1 School yard (within 3 steps of latrine)…….2 School yard (within 3 to 10 steps of latrine)…….3 Out of school yard (More than 10 steps from the school yard)……..4	Main water source of the school……..1 Specially designed Hw devise(Drum with a tap)…….2 Tap w/o bowl…….3 Water container(Bucket) …….4 Other……..77	Yes…1 No….2 Not possible to observe…..3
Col=2	Col=3	Col=4	Col=5	Col=6	Col=7	Col=8	Col=9	Col=10

Physical Survey

In order to obtain information on the physical environment of the schools and the status of WASH facilities a physical survey was administered at each participating school. Following the structured observation field research assistants obtained permission from the head master to conduct a physical survey of the school facilities. There may have been some discrepancy in terms of water availability if it had been depleted during the time of structured observation. However, this is important data to capture to see whether resources are being replenished as they are used. The physical survey examined each school's latrine facilities in detail. For example, the field researcher determined the users of the latrine (male students, female students, teachers only), type of latrine, and the usability of the facility, whether or not it was clean and if water was available. In addition, field researchers examined water source availability at the school and if not available, where the school obtains water. Follow up questions for the WASH facilities were inquired upon regarding who was responsible for maintaining and cleaning the facilities. The school grounds were also viewed to determine if feces were visible or the smell of feces was apparent to determine if open defecation was occurring on school property. All of the information gathered was recorded on the survey and reviewed the day of collection.

Head Master Survey

The head master survey was implemented to determine the hygiene curriculum and understand the SHEWA-B project implementation in each of the participating schools. If the headmaster was not available, the teacher in charge was surveyed. The headmasters were told that they could refuse to answer any questions that they did not feel comfortable answering, however most headmasters answered all of the given questions. The head master was asked to answer questions from the survey regarding their personal efforts towards the school's hygiene

program, and what they felt are the most significant barriers that they face to ensure that students' practiced proper hygiene and sanitation behaviors. The questions regarding the barriers to proper sanitation and hygiene were also given to students in the student survey to identify whether or not they both presented the same barriers or different issues.

The questions asked were designed to obtain perspectives of the school staff and faculty and their thoughts on the strengths of the SHEWA-B program and how they thought the program could be improved. Although there may have been some differences in the perspectives of the head master and teachers, the head master is generally in charge of the establishment of the SHEWA-B Program at each school and therefore will have critical knowledge to share.

Within the SHEWA-B program the Community Hygiene Promoter (CHP) has been instructed to visit schools within the community and teach about proper sanitation and hygiene practices, and can also assist with the school hygiene program if needed. Questions regarding the (CHP) were inquired upon, such as, if the headmaster knows the promoter's name and how often they come to the school. The motivation of the head master was measured by asking if the headmaster has implemented any of the SHEWA-B initiatives, such as having a yearly sanitation and hygiene plan, or any personal initiatives. It was assumed that if the head master had taken action to improve the WASH program it would gauge how much the school administration was invested in the program.

Student Survey

Four students were selected from each school to participate in the student survey. One male student and one female student were chosen from both classes four and five. Students were randomly selected from the student roll list of that day by choosing the 10^{th} boy and the 10^{th} girl

on the list for grades four and five. The students were asked to step out of the class room away from other students and teachers to complete the questionnaire individually with the FRA. The students were assured that their answers would be kept confidential in order to encourage accurate response. The questions were asked in an order designed to gain an accurate picture of student access and use of toilet facilities and other water, sanitation and hygiene facilities in schools. Although students are prone to social desirability bias, the survey was used to triangulate the survey answers to the behavior observed during the structured observation survey. Likert-type 3-point scales ranging from always, sometimes, or never, were used for numerous questions on the survey. This scale was used for a series of questions regarding the accessibility of specific WASH facilities and resources such as soap, water, latrines, etc. Students were also asked about the major barriers for their use of WASH facilities and proper hygiene behavior. The headmasters where asked the same questions, and the answers were compared to distinguish different perspectives of barriers.

3.6 Ethics

Permission to enter schools in specific upazilas for research purposes was obtained from the Divisional Primary Education Office. Each school provided written consent before conducting any research activities. The study was covered under ICDDR,B Internal Review Board (IRB) guidelines. Additionally, the secondary analysis for this thesis was deemed "not human subjects" research by Emory IRB, and with submission of official documentation from ICDDR,B stating that they would not release linked identifiers, an IRB review process was not required.

3.7 Data Quality Control

During the collection, the FRO assigned to each team of 10 FRAs checked data when it was collected and provided feedback if any problems arose in the field. The FROs consulted with the ICDDR,B research investigators on issues of field site locations and survey questions when needed. In addition, immediately following data entry, data were thoroughly cleaned and cross checked. Data was also examined by FRAs to see if there were any discrepancies in data collection methods. All surveys were composed in English then translated to Bengali and then translated back to English to ensure proper translation.

3.8 Data Organization

Following data collection, the paper surveys were input into separate access databases for each survey type with at total of four databases. In all, 50 head master surveys, 50, physical surveys, 50 structured observation surveys with 621 observations of hand washing opportunities, and 200 student surveys were included in the databases. The answers to open ended questions and "other" options were compiled in a list to identify the most frequent answers. These answers were then input into the database as an additional option to the question. The databases have been merged in order to conduct analysis between the surveys.

3.9 Data analysis

The study dataset was analyzed using SAS v9.2 statistical software (Cary, NC), and Microsoft Office Excel 2007 software. The data were checked for implausible values, and missing data. Descriptive analyses were performed followed by cross tabulations to calculate frequencies. Data examined included investigating the proportion of observations of students washing their hands with soap after toilet use, and proportion of schools with functioning

latrines. In the descriptive tables proportions (%) are presented along with the numerators (n) and denominators (N) and standard deviations (SD).

The study includes one primary outcome variable, which was whether or not a student washed their hands after using the latrine (dichotomous variable). To determine associations between chosen variables and the outcome of hand washing, chi-square tests were performed. A generalized estimating equation (GEE) regression model was created to model WASH study components that are determinant of hand washing behavior. The GEE regression model was chosen due to the clustered nature of the dataset. The GEE model is an extension of the logistic regression model for correlated responses, and takes into account the repeated observations taken at each school. The GEE model was fit by using the GENMOD procedure in SAS v9.2 (SAS Institute Inc. Cary, NC, USA)

Chapter 4: Results

This section reviews a summary of the results and findings of the SHEWA-B school study project from all study instruments used.

4.1 Study population

Surveyed schools had demographics similar to the total intervention schools. Information from the baseline survey conducted in 2007 reported that the average number of students per school was 382, and our study population average was 325. Additionally, a majority of both schools had roughly equal numbers of female and male students. Table 4.1 includes further demographic detail about the study population. Within study schools, over 80% of the schools had received software components, approximately 10% had received funding for new facilities and a little over 20% had received funding for repairing facilities. On average each school had two functional latrines. Latrines were typically located next to the main school building or behind it. The water source (e.g. tube well) usually would be found near the latrine area as well. Figures 4.1- 4.4 are examples of typical primary school settings in Bangladesh.

Table 4.2 is a comprehensive table including information on all fifty participating schools. The table is divided into schools with soap and water available for hand washing, and schools without soap but with water available for hand washing. This information allows a clear comparison of these two groups. In schools with soap, nine out of 25 received a hardware component from the SHEWA-B program and even two schools received all five hardware improvements. Only five out of 25 Schools without soap received a hardware intervention, and three out of the five schools received only repair of existing facilities. In terms of overall hand washing rates were higher in schools with soap, and expectedly, rates of hand washing with soap

were also higher in schools with soap and water available for hand washing. It seems that much of the differences in hand washing rates seen in these two groups are due to issues of access to water, sanitation, and hygiene facilities. These separate issues will be explored in more detail in the remainder of this chapter.

Table 4.1 Primary School Demographics

Primary Schools (N=50)*	n/N	n (%) or SD
Type of School		
Government Primary School	40/50	80%
Registered Non-Gov Primary School	10/50	20%
Total number of students	18337	
Total number of male student	8639	
Total number of female students	9698	
Mean of students per school	325	162
Mean of male students per school	153	76
Mean of female students per school	173	88
Implemented program components**		
Training all teachers and school management committee (SMC) on sanitation and hygiene education	41/50	82%
Program curriculum and materials on hygiene	39/50	78%
Received funds to repair existing WASH facilities	12/50	24%
Received funds for new latrine facility	9/50	18%
Received funds for new water point facility	5/50	10%
Received nothing	2/50	4%

*Taken from Head Master Survey & Physical Survey ** Multiple responses allowed

Table 4.2 Description of 50 Participating Schools

Column	A	B	C	D	E	F	G	H	I	J	K
	School ID	Upazila	No. of Students	WASH Package	No. of functional and open latrines	No. of latrines with soap and water	Water Source	HW Place	No. of latrine events	% Overall HW**	% HW-WS*
Row	Schools with soap and water available for hand washing										
1	**103**	Manikchari	347	1, 2	1	0	0	4	3	100%	0%
2	**105**	Manikchari	530	1, 2	3	1	1	1	18	83%	11%
3	**106**	Manikchari	676	1, 2, 5	4	0	1	1	17	94%	6%
4	**107**	Manikchari	138	1, 2, 5	2	1	3	1	1	100%	0%
5	**109**	Manikchari	209	1, 2	2	2	0	4	16	69%	38%
6	**202**	Narshingdi sadar	237	0	2	2	1	4	5	0%	0%
7	**204**	Narshingdi Sadar	459	1, 5	3	2	2	4	26	100%	4%
8	**205**	Narshingdi Sadar	449	1, 2, 5	2	2	1	1	24	75%	13%
9	**206**	Narshingdi Sadar	584	2, 4	0	0	1, 5	1	16	75%	25%
10	**207**	Narshingdi sadar	331	1, 2	1	1	1	1	7	86%	0%
11	**208**	Narshingdi sadar	388	1, 2	2	1	1	1	19	79%	37%

12	**210**	Narshingdi sadar	438	3, 4	3	3	1, 1, 5	1	19	84%	53%
13	**305**	Raipura	252	1, 2	1	0	1	1	0	0%	0%
14	**306**	Raipura	411	1, 2	1	1	0	4	0	0%	0%
15	**308**	Raipura	225	1, 2	2	1	0	4	3	33%	0%
16	**309**	Raipura	343	1, 2, 5	2	0	1	1	6	83%	50%
17	**310**	Raipura	415	1, 2, 3, 4, 5	3	1	1	1	9	67%	33%
18	**503**	Rajnagar	223	1	2	1	2	1	39	77%	8%
19	**504**	Rajnagar	272	2, 3	2	0	1	1	26	81%	0%
20	**508**	Rajnagar	129	1, 2, 3	1	1	1	4	16	88%	75%
21	**509**	Rajnagar	135	1, 2, 3, 4, 5	3	0	1	1	31	77%	55%
22	**603**	Belabo	332	1, 3, 4	2	2	1, 2	1	45	91%	22%
23	**605**	Belabo	181	1, 2	3	1	1	1	16	25%	0%
24	**608**	Belabo	136	1, 2, 5	2	2	1	1	13	100%	31%
25	**610**	Belabo	363	1, 2	2	1	1	1	17	100%	24%
	Schools without soap for hand washing at the main place of hand washing										
26	**101**	Manik Chori	112	2	0	0	0	0	0	0%	0%
27	**102**	Manik Chori	236	1, 2	1	0	0	1	4	25%	0%
28	**104**	Manikchari	430	1, 2, 5	2	0	14	1	22	64%	0%
29	**108**	Manikchari	204	1, 2, 5	2	0	3	1	2	100%	0%

30	**110**	Manikchari	335	1, 2	1	0	0	0	0	0%	0%
31	**201**	Narshingdi sadar	553	1, 2	3	0	1, 1	1	9	78%	11%
32	**203**	Narshingdi sadar	405	1, 3, 5	0	0	1, 1	1	0	0%	0%
33	**209**	Narshingdi sadar	734	1, 2, 3	2	0	1	1	11	55%	0%
34	**301**	Raipura	568	1, 2	1	1	1, 5	1	2	50%	0%
35	**302**	Raipura	617	6	2	1	1	1	0	0%	0%
36	**303**	Raipura	364	1	2	1	1	1	43	51%	0%
37	**304**	Raipura	467	1, 2	2	1	1	1	15	73%	0%
38	**307**	Raipura	300	1	2	1	1, 2	1	3	67%	0%
39	**501**	Rajnagar	110	2	2	0	1	1	4	100%	100%
40	**502**	Rajnagar	585	5	4	1	2	1	58	53%	34%
41	**505**	Rajnagar	188	1, 2	2	0	0	0	4	0%	0%
42	**506**	Rajnagar	123	1, 2, 3	2	0	1	1	7	43%	14%
43	**507**	Rajnagar	189	1, 2	1	0	0	0	0	0%	0%
44	**510**	Rajnagar	198	6	2	0	1, 1	0	22	82%	5%
45	**601**	Belabo	236	1, 2	2	0	1, 1	1	0	0%	0%
46	**602**	Belabo	350	1, 2	2	1	1	1	5	20%	0%
47	**604**	Belabo	155	1, 2	1	0	1	1	4	100%	0%
48	**606**	Balabo	162	1, 2	2	0	1	1	7	29%	0%

49	**607**	Belabo	175	1, 2	2	0	2	1	7	71%	0%
50	**609**	Belabo	250	1, 2	2	1	0	4	5	40%	0%

**Any form of hand washing practice
*hand washing with soap includes washing one or both hands

Table 4.3 Table 4.2 Key

Table 4.2 Key	Column1
WASH Package	
Training of all teachers and school committee members	1
Received program curriculum and education materials on hygiene	2
Received funding for latrine facilities	3
Received funding for a water source	4
Repair of existing WASH Facilities	5
Received nothing	6
Water Source	
Shallow tube-well	1
Deep tube-well	2
Protected ring/Dug well	3
Tara pump	5
Piped in water	14
HW: Place of hand washing	
Water source	1
Water container (e.g. bucket, bodna)	4
No place for hand washing	0

4.2 Spot Check of Water Facilities

Knowledge of hand washing hygiene cannot be put into practice if proper WASH facilities are not in place. Therefore, the facility spot check of schools was necessary to isolate the factors in the physical environment favoring or discouraging hand washing with soap in schools. The schools that were surveyed had relatively adequate access and availability to water. Eighty percent of schools had at least one water source available, but only 66% of schools had a water source that is available all year round. Over 90% of the schools had a device (e.g. water jug, tippy tap) to store water for hand washing, and 88% of the devices were found with water in them during the facility spot check [Table 4.2].

The shallow tube well is the most common and low cost tube-well technology in Bangladesh (Bangladesh 2006). The popularity of the tube well was apparent in our study population, with 83% of schools with a water source on school property possessing a shallow tube well. This can be problematic because shallow tube wells are more prone to drying-up during the summer seasons than deep tube wells, due to a lower water table. The problem of seasonal water availability is seen in many parts of Bangladesh, where during the rainy season water is abundantly available, but during the dry season many water sources become unserviceable. Figures 4.1 and 4.2 are typical settings in primary schools in Bangladesh with respect to water facilities.

Table 4.2 Water facilities found in each primary school

Water Source (N=40)*	**Frequency**
Primary Schools with a water source on school property	**40/50 (80%)**
Type of water source	
Shallow tube well	33/40* (83%)
Deep tube well	4/40 (10%)
Protected ring/dug well	2/40 (5%)
Unprotected dug well	1/40 (2%)
Proportion of schools with: (N=50) Schools	

A device used for water supply for hand washing	46/50 (92%)
A device used for water supply for hand washing found with water	44/50 (88%)
At least one water source	40/50 (80%)
At least one water source that has water available all year	33/50 (66%)
At least one water source that has water available all year and found clean**	23/50 (46%)
A device used for water supply for hand washing found with water and hand cleansing agents*** available	22/50 (44%)

*Taken from Physical Survey, ** Clean: free of dung and solid waste, ***Soap, detergent, mud, ash

Figure 4.1 Hand Washing

Figure 4.2 Students at Water Point

4.3 Observed Hand Washing Behavior

Within the scope of the structured observation survey, the main focus was on hand washing behavior after defecation or latrine use. Due to the constraints of confirming whether the student has defecated or not, the observations were characterized as hand washing practices following latrine use. Additionally, if there was water and soap inside the latrine, hand washing inside a closed latrine was not observed or recorded. There were approximately 26 schools that had at least one latrine with water and soap available inside, so there may have been missed observations of hand washing with soap after latrine use due to this circumstance. There were 36 latrines total out of 146 that had cleansing materials inside the facilities, with a maximum of three latrines at one school with soap and water inside the latrines. Through a review of the data, only two out of the eight schools that did not have any

hand washing observations were in the group of schools with soap and water inside the latrine. Observed hand washing was documented only if the field research officer could observe hand washing behaviors, which was generally only outside of the latrines.

Within the fifty schools, 626 observations of hand washing opportunities after toilet use were recorded, and within the 626 observations 451 students practiced some form of hand washing. Out of the fifty schools visited, observations of hand washing behavior were recorded at forty-two. There are some acceptable reasons why eight schools did not have any observations collected; such as a lack of a place for hand washing (n=4), lack of latrine facilities (n=2), lack of water for hand washing (n=4), and it is possible that students may not have used the latrine during the observation period (n=6).

Additionally, out of the fifty schools, twenty-five had hand washing facilities with soap and water available at an area specified for hand washing, and twenty-one had a hand washing facility or water source but no soap available at the main place of hand washing, and four schools did not have a hand washing facility, water source, or soap. The hand washing behaviors of students from all schools is documented in Table 4.3, and hand washing practices are broken down into the categories of overall schools, schools with soap and water available for hand washing, and schools with only water available for hand washing. The four schools without water or soap available and other four schools without any observed hand washing opportunities and were not included in the tables.

The percentage of students from all schools who were observed to wash both hands with soap after toilet use was 21%. [Table 4.3] Male students had slightly lower rates of hand washing, with 63% of males and 75% of females students observed after latrine use performing some hand washing behavior (n= 451, p-value= 0.003). In the study considerably more female students used the latrine than male students: 459 of the 626 observations were of

female students. This occurrence may be explained by the higher levels of modesty in female students, and the need to have privacy for urination and defecation. Many male students were seen urinating openly next on school grounds, and did not use the latrines for urination.

Despite the fact that current literature reports that ash and mud are commonly used as hand washing agents in Bangladesh, these materials were not found to be common cleansing materials in our study. Only one student was observed to use ash or mud during hand washing. Although observations for the gold standard of washing both hands with soap was relatively low at 21%, 72% of the students who were observed using the latrine facilities performed some hand washing practice. [Table 4.3] The number of hand washing events where the FRA was unable to observe the use of hand washing materials ranged from 24% to 36%. This large number of missing data on hand cleansing materials such as soap, mud, and ash may have occurred due to the large number of students washing their hands at the same time, or the inability of the FRA to view each student as they washed their hands.

In schools with soap and water available at the hand washing station approximately 80% of observed students washed their hands. In comparison, the schools with water at the hand washing facility and no soap had 58% of students perform some hand washing behavior after latrine use. This is a noticeably large difference in hand hygiene behaviors in comparing these two groups of schools. Three hundred and fifteen out of the 451 hand washing events occurred in schools with soap and water for hand washing and only 136 were observed in schools without soap ($p<0.0001$). There may be numerous factors that play into this gap. Additionally, the physical survey indicates twenty-five schools did not have soap at the main hand washing station, but still seven percent of students in these schools were reported to have washed both hands with soap. Students may have taken soap from the latrine or another location to wash their hands. Needless to say, soap is not readily available

for hand washing in these schools and even then, only 27% of students washed both hands with water. [Table 4.3]

When comparing the schools with soap and water available for hand washing to the schools with only water available for hand washing, 37% of students observed using the latrine in schools with soap washed both hands with only water and only 27% of the students with water only at schools washed both hands with water. [Table 4.3] It would be expected that within schools with soap and water, there would be higher rates of hand washing with soap. Also, in the schools with only water available for hand washing it is surprising that only 27% of students washed both of their hands with water. However, when looking at the place of hand washing, 22% of hand washing events in schools with only water had the hand washing place out of the school yard further than 10 steps from the school yard. Forty-one percent of the schools with soap and water had the hand washing place 3-10 steps from the latrine. This information could help explain some the differences, by the fact that the hand washing place for the schools with only water is much more inconvenient than for schools with soap and water available due to distance of hand washing place. Of course this information is only a small part of the whole picture.

The water source for 54% of hand washing in schools with soap and water was the main water source (e.g. tube well), while 63% of hand washing events in schools with water only used a water container for hand washing. Forty out of the fifty schools reported to have a water source on school premises. However, the main hand washing places in schools without soap available are water containers. By using water containers for hand washing this creates more responsibilities for students and teachers to keep water filled in the container for hand washing use. All of these issues compound and make it more difficult for proper hand washing behaviors in schools.

Hand drying practices were also noted during the observation. Only 9% of students dried their hands appropriately, which is defined by air drying or drying with a clean cloth if available. The FRA was only able to observe hand drying practices directly after hand washing was performed and therefore may not have captured a completely accurate representation of hand drying behavior. The most popular method for drying hands was on clothing, with 59% of observed students practicing this method. This method of drying hands on clothing was generally done directly after hand washing, and may have been more precisely measured. [Table 4.3] Lastly, during the structured observation, FRAs were instructed to report any observed open defecation. However, students typically went into the bushes or more secluded areas to practice open defecation and consequently this behavior was difficult to capture. Only one student was observed openly defecating at school. Figures 4.3 and 4.4 depict typical latrine setting in primary schools in Bangladesh.

Figure 4.3 Open School Urinal

Figure 4.4 Inside a School Latrine

Table 4.3 Observed Hand-washing Among Primary School Students After LatrineUse

Observed Hand Washing Opportunities (42 schools with water available for hand washing)	Overall (N=42)	Schools with soap available (N=23 schools)	Schools with no soap available (N=19)
	N/N (%)	n/N (%)	n/N (%)
Total # of observation of hand washing opportunities after using the toilet	**626 Students Observed**	**392 Students Observed**	**234 Students Observed**
Washed hands	**451/626 (72%)**	**315/392 (80%)**	**136/234 (58%)**
Washed both hands with soap	96/451 (21%)	87/315 (28%)	9/136 (7%)
Washed one hand with soap	3/451 (0%)	3/315 (1%)	0/136 (0%)
Washed both hands with water only	154/451 (34%)	117/315 (37%)	37/136 (27%)
Washed one hand with water only	75/451 (17%)	37/315 (12%)	38/136 (28%)
Washed hands with ash/mud (one or both)	1/451 (0%)	0/315 (0%)	1/136 (0%)
Not possible to observe hand washing materials used	119/451 (26%)	70/315 (22%)	49/136 (36%)
Observed hand drying behaviors after hand washing (N=450)	**450**	**314**	**136**
Students who dried hands appropriately**	39/450 (9%)	31/282 (11%)	8/152 (5%)
Not dried	145/450 (32%)	100/282 (34%)	45/152 (30%)
Dried on clothing	266/450 (59%)	183/282 (55%)	83/152 (65%)

** Hands air dried or on a clean cloth
***Taken from structured observation;

4.4 Spot Check of Latrine Facilities

Latrines were categorized as functional in the study if they were connected to an unfilled pit and found open and being used by students or teachers by the FRA. A variety of latrines was found in schools. Table 4.4 lists the specific types of latrines found. Seventy-two percent of schools had improved latrines, and an off-set flush to pit latrine was the most common latrine found. Forty-eight schools had at least one functional latrine, and out of the 146 latrines found in the 50 schools, 76% of the latrines were functional. [Table 4.4] This data is evidence of the growing problem schools have with non-functioning abandoned

latrines, where approximately one quarter of latrines require maintenance. The issue has been raised regarding the sustainability of single-pit latrines, and the difficulty that arises when the latrine must be emptied. The average number of students per functional latrine is 163.

In addition, 32-36% of schools separated latrines for use by female and males students whereas the majority had non-gender-specific latrines. Over fifty percent (n=26) of schools had soap and water available inside at least one functional latrine. [Table 4.4] Unfortunately, these findings complicated our method for measuring hand washing behavior. The schools found with soap and water in at least one latrine were statistically different from other schools ($p<0.001$). Teacher-specific latrines were found to be marginally better maintained than student latrines. Forty-four percent of schools (n=22) had at least one functional latrine specified for teachers, and 36% of schools had one latrine specified for female students

Table 4.4 Primary school latrine facilities determined through visual 'spot checks'

School Facility Spot Check (N=146)****	
	n/N SD
Mean number of latrines per school	5 (12)
Mean number of functional latrines per school	2
Mean number of students per school	325 (162)
Mean number of students per latrine	69
Mean number of students per functional latrine	163
Type of Latrine	**n/N (%)**
Improved Latrine*	**106/146 (73%)**
Flush to pit latrine (off set)	69/146 (47%)
Septic tank	36/146 (25%)
Ventilated Improved Pit (VIP) latrine	1/146 (0.5%)
Unimproved Latrine**	**40/146 (27 %)**
Pit latrine with slab & no water seal/broken water seal and no lid	36/146 (25%)
Flush or pour flush toilet connected to (canal, ditch, river, etc)	2/146 (1%)
Pit latrine without slab/open pit	2/146 (1%)
Proportion of latrines: (N=146)	**n/N (%)**
Functional latrines	111/146 (76%)
Functional latrines found open during spot check	95/146 (65%)
Functional latrines found open w/o*** stool and w/o smell	32/146 (22%)

Functional latrines found open w/o stool and w/o smell and water available inside	24/146 (16%)
Proportion of schools with: (N=50)	**n/N (%)**
At least one functional latrine	48/50 (96 %)
At least one functional latrine found open for student use	48/50 (96%)
At least one functional latrine found open and w/o smell for student use	26/50 (52%)
At least one functional latrine found open with soap and water available	26/50 (52%)
At least one functional latrine specified for teachers	22/50 (44%)
At least one functional latrine specified for girls	18/50 (36%)
At least one functional latrine specified for boys	16/50 (32%)
At least one functional latrine found open w/o stool and w/o smell and water and soap available inside	16/50 (32%)

*Improve latrine: flush toilet, pit latrine with slab
**Unimproved latrine: flush toilet connected to open location, pit latrine w/o slab, hanging toilet

4.5 Barriers to WASH Facilities

Perceived barriers can be considerably different for a head master and a student. Through the study we asked head masters and students what they perceived to be the most significant barriers to access to hand washing facilities. The survey had closed answer formatted questions, but with the option to include their perceived barrier if it was not listed on the survey. Table 4.5 includes the responses of all of the schools, and Table 4.6 is the responses from schools that were found without water, soap or both during the facility spot check.

Overall, the most cited barriers to students lacking access to soap for both students and head master was that "students steal or damage the soap." For the most significant barrier to washing hands with soap after toilet use from the head master was "lack of knowledge", however, students stated that the largest barrier was a "lack of continuous water supply at the hand washing station." The barrier for students accessing the latrine cited from the head masters was that the "latrine is out of order" and for students it was because there is "no water available in the latrine." [Table 4.5]

In comparison, when analyzing only the schools that were found without soap, water, or both, they had similar responses. The head masters and students agreed that the most common reason that soap would not be available is because "students steal or damage it." In regards to why students don't wash their hands after latrine use, students from these specific schools said it was mainly because of the "lack of a designated hand washing station." Additionally, students said that the reason why they didn't use the school latrine was because there is "no water available in the latrine" and "latrine is out of order." [Table 4.6]

Students were asked if they felt they always, sometimes, or never had access to certain WASH facilities and approximately 80% of students felt they always had access to latrines, enough water to wash their hands, and able to wash hands at school. These results were somewhat in line with what was found in the spot check of schools, it was found that only 65% of schools had a functional open latrines during the visit. The answers reported on the student survey may have an aspect of social desirability bias that needs to be taken into consideration.

Forty percent of students said they always had access to soap. Although schools may have soap available sometimes teachers of head masters may keep it in a locked location. [Table 4.7] Additionally, the issue of head masters and teacher locking latrine facilities as to not dirty them was brought up numerous times anecdotally, but was only seen a few times during the study. It was also possible for head masters or school staff to have opened the latrines before the spot check due to the time spent speaking with the head master before conducting the study components.

Table 4.5 Barriers to access of sanitation facilities by head master and students in all schools

Barriers to access to sanitation facilities (N=50 Head Master) (N=200 Students)	Headmaster	Students
	n/N (%)	n/N (%)
Most cited barriers for lack of access to soap		
Students steal or damage it	27/50 (54%)	34/98* (39%)
No current/existing fund for soap	19/50 (38%)	/
Taken by animals	14/50 (28%)	16/98 (16%)
Used up too quickly because too many students	9/50 (18%)	23/98 (24%)
Lack of continuous fund for buying soap	7/50 (14%)	/
Soap is not made available because students waste soap	10/50 (20%)	/
It has not been purchased	/	19/98 (19%)
Stolen by people from outside the school	6/50 (12%)	17/98 (17%)
Teachers did not make it available	/	13/98 (13%)
Soap is lost	/	4/98 (4%)
Most cited barriers for students not adhering to hand washing with soap after toilet use		
Lack of Knowledge	44/50 (88%)	/
Lack of continuous water at hand washing station	17/50 (34%)	26/42 (62%)
No designated place for hand washing	7/50 (14%)	16/42 (37%)
Lack of Motivation	19/50 (38%)	/
Lack of soap at hand washing station	15/50 (30%)	10/42 (24%)
Not a habit	7/50 (14%)	/
Difficult to bring water from water source	/	4/42 (10%)
Not enough hand washing stations for students	4/50 (8%)	/
Lack of money for hand washing materials	2/50 (4%)	/
No water source	/	1/42 (2%)
Not needed	/	2/42 (1%)
Most cited barriers for students to use the school latrine		
No water available in the latrine	22/50 (44%)	19/42 (45%)
Too many students using the latrine	21/50 (42%)	17/42 (41%)
Latrine out of order	23/50 (46%)	11/42 (26%)
Dirty latrine	22/50 (44%)	10/42 (24%)
Locked/closed latrine	14/50 (28%)	16/42 (38%)
Latrine use not practiced at home	3/50 (6%)	/
Not comfortable using the latrine	2/50 (4%)	/
No door	0/50 (0%)	1/42 (2%)
No separate latrine for girls and boys	1/50 (2%)	/
No separate latrine for students and teachers	1/50 (2%)	/

*Out of students who responded to survey question (if they stated earlier they do not always have access to WASH facilities)
*Multiple answers allowed
*Taken from Head Master and Student Survey

Table 4.6 Barriers to access of sanitation facilities from schools found without soap or water or both during the facility spot check

Barriers to access to sanitation facilities in schools without facilities (N=28 Head Master) (N=112 Students)	Headmaster	Students
	n/N (%)	n/N (%)
Most cited barriers for lack of access to soap		
Students steal or damage it	16/28 (57%)	20/62* (32%)
Stolen by people from outside the school	/	14/62 (23%)
Used up too quickly because too many students	9/28 (32%)	11/62 (18%)
Lack of continuous fund for buying soap	9/28 (32%)	/
It has not been purchased	6/28 (21%)	8/62 (13%)
Soap is not made available because students waste soap	5/28 (18%)	/
Teachers did not make it available	/	9/62 (15%)
Most cited barriers for students not adhering to hand washing with soap after toilet use		
Lack of Knowledge	24/28 (86%)	/
Lack of Motivation	11/28 (39%)	/
Lack of continuous water at hand washing station	11/28 (39%)	19/31 (61%)
No designated place for hand washing	/	11/31 (35%)
Lack of soap at hand washing station	8/28 (29%)	6/31 (20%)
Not a habit	5/28 (18%)	/
Difficult to bring water from water source	/	3/31 (10%)
No water source	/	1/31 (3%)
Most cited barriers for students to use the school latrine		
Too many students using the latrine	14/28 (50%)	6/27 (22%)
Dirty latrine	13/28 (46%)	9/27 (33%)
No water available in the latrine	13/28 (46%)	14/27 (52%)
Latrine is out of order	11/28 (39%)	10/27 (37%)
Locked/closed latrine	6/28 (21%)	9/27 (33%)
Latrine use not practiced at home	6/28 (21%)	/

Table 4.7 Access to sanitation facilities

Access to sanitation facilities (N=200 students*)		
Students who said they <u>always</u> have:	**n/N**	**%**
Facilities available to enable students to wash hands at school	156/187*	83%
Enough water for hand washing	136/163	83%
Access to latrines	143/185	77%
Soap	65/163	40%

*Out of students who responded to survey question (if they stated earlier they do not always have access to WASH facilities)
*****Taken from Head Master and Student Survey

4.6 Motivation of Headmaster

Motivation of leaders is imperative to the success of a program. The head master was interviewed and asked about specific initiatives that they have taken for their school's sanitation and hygiene program. The challenge of having a continuous supply of soap, water and funding appeared to the most difficult with only 26-35 head masters having taken initiatives to fix the problem. More than 80% of head masters reported undertaking initiatives to ameliorate the issues of hand washing with soap and latrine use as well as taking imitative to increase knowledge on water and sanitation issues. [Table 4.8]

Table 4.8 Head Master Motivation

Head Master Motivation (N=50)	
Proportion of head masters who have taken at least one initiative:	**n/N (%)**
To ensure that students are able to practice good water, sanitation and hygiene	**49/50 (98%)**
Top 3 initiatives cited:	
1) Developed school brigade	39/49 (80%)
3) Arranged for weekly class on sanitation and hygiene for students	29/49 (59%)
2) Arranged for soap in the toilet and HW station	22/49 (45%)
To overcome challenges of having *continuous* supply of soap	**26/50 (52%)**
Top 3 initiatives cited:	
1) Arranged fund for soap	11/26 (42%)
2) Arranged to keep soap in a safe specific location (e.g. soap case etc.)	9/26 (35%)
3) Monitor the soap use and supply	4/26 (15%)
To overcome challenges of students not adhering to hand washing with soap	**46/50 (92%)**
Top 3 initiatives cited:	
1) Increased awareness regarding sanitation and hygiene among parents	23/46 (50%)
2) Increased awareness regarding sanitation and hygiene among students	21/46 (46%)
3) Arranged for soap and water in hand washing station	13/46 (28%)
To overcome challenges of students not using the latrine	**41/50 (82%)**
Top 3 initiatives cited:	
1) Applied for funding for latrine facilities	15/41 (37%)
2) Built new latrine or repaired old latrine	13/41 (32%)
3) Arranged to keep the toilet clean	9/41 (22%)
To maintain a *continuous* supply of water at the hand washing station	**35/50 (70%)**
Top 3 initiatives cited:	
1) Arranged for water vessel and soap at the place of hand washing	14/35 (40%)
2) Applied for funding for water source	10/35 (29%)

3) Build or repair water source	10/35 (29%)
To bring in funding for the school's hygiene program	**32/50 (64%)**
Top 3 initiatives cited:	
1) Applied for government financial assistance	27/32 (84%)
2) Seek funding from non-profit organizations	24/32 (75%)
3) Applied to SMC for assistance	18/32 (56%)
Proportion of head masters who are:	
Able to name at least one responsibility of the student brigade	50/50 (100%)
Able to name a specific fund/plan for supplying school with soap	39/50 (78%)
Able to name the school's community health promoter	29/50 (58%)

* Information taken from the Head Master Survey

4.7 Student reported hygiene behaviors

The students surveyed ranged in age from 8-15 years old. Students reported the location where a female or male student would urinate and defecate at school. Male students were reported to urinate most commonly in the school latrine, urinal, and bushes, but also behind the school latrine. Female students also had similar locations of urination, in the school latrine and bushes. As seen in the structural observations 84% students reported that females urinate in the latrine and only 57% of male student used the latrine for urination.

As for defecation, males were reported more frequently to defecate in the open (4%) and also defecation during school hours can occur at the home or neighbors' latrine. Hand washing was most commonly reported being practiced before eating, followed by after a visit to the latrine. The reports of hand washing after using the latrine was surprising lower than observed with the structural observations of 72% of students practice some type of hand washing and only 45% of students stating that they would wash their hands at that time. However, in terms of hand washing with soap the observations of only 21% of students practicing this behavior was much lower than the 45% of reported hand washing.

Table 4.9 Student Reported Hygiene Behaviors

Student Reported Behaviors (N=200)	Female	Male
Where students defecate at school	**n/N (%)**	**n/N (%)**
School latrine	181/200 (94%)	177/200 (89%)
Home or neighbor's latrine	14/200 (7%)	10/200 (5%)
Bush/field	2/200 (1%)	8/200 (4%)
Mosque latrine	0/200 (0%)	1/200 (0%)
Where students urinate at school	**n/N**	**n/N (%)**
School latrine	167/200 (84%)	114/200 (57%)
Bush/field	13/200 (7%)	51/200 (26%)
School urinal	11/200 (6%)	23/200 (12%)
On school grounds	1/200 (0%)	6/200 (3%)
Public latrine nearby	4/200 (2%)	0/200 (0%)
Latrine at home or at neighbor's latrine	3/200 (2%)	1/200 (0%)
Behind school latrines	0/200 (0%)	3/200 (2%)
Mosque latrine	0/200 (0%)	1/200 (0%)
When students report generally wash their hands during the day*	**n/N (%)**	**n/N (%)**
Before eating	94/200 (47%)	94/200 (47%)
After visiting the latrine	89/200 (45%)	84/200 (42%)
After eating	41/200 (21%)	43/200 (22%)
After picking up rubbish/garbage	23/200 (12%)	27/200 (14%)
After handling dirty things	18/200 (9%)	16/200 (8%)
After playing	18/200 (9%)	17/200 (9%)

*multiple answers allowed

4.8 School Hygiene Program Improvement

One of the main objectives of the study was to identify problems within the program and determine possible opportunities to remedy the situation. The head master and other school faculty generally have knowledge of the strengths and weakness of the program in which they are participating. Therefore, the head master was asked about improvements they would suggest for the hygiene curriculum and also for the program as a whole. The question regarding the improvements on hygiene curriculum was in an open ended format, and the question about the program as a whole was presented in a closed format but with the option

to include unique answers that were not provided on the survey. The most commonly cited improvement of the hygiene curriculum was to increase the quality of the pictures and the titles of hygiene materials such as the books. In addition, the most cited improvement for the program as a whole was to give funding for water and sanitation facilities at school.

Table 4.11 School Program Improvement

School Program Improvement (N=50)	
Top cited suggestions	**n/N (%)**
Improvements hygiene curriculum (N=43)*	
1) Title and the pictures of the books should be improved (e.g. bigger/more colorful)	9/43 (21%)
2) Stories should be written with more detail and made appropriate for school hours	9/43 (21%)
3) Stories should reflect real life and have human characters	6/43 (14%)
4) Increase the number of materials given to each school	5/43 (12%)
5) Books should be easier for children to understand	3/43 (7%)
6) Need a separate class for sanitation and hygiene in school curriculum	3/43 (7%)
7) Included more audio-visual materials	2/43 (5%)
Improvements for the program as a whole (N=50)*	
1) Need funding for installing water and sanitation facilities	21/50 (42%)
2) Increase existing funding	15/50 (30%)
3) More support from organizations	14/50 (28%)
4) Better quality of educational materials	11/50 (22%)
5) Better organization and monitoring of program	11/50 (22%)
6) Better and longer training for teachers	5/50 (10%)
7) Education for parents and community members on hygiene	5/50 (10%)

*Number of Head Masters who answered the question
**Multiple answers allowed

4.9 Program Indicators of Practicing Hand Hygiene

Additionally, in order to determine WASH program components that are determinants of hand washing behavior in primary school settings a generalized estimating equation (GEE) regression model was created. Due to the limited number of students who were observed

washing both hands with soap, the outcome variable is defined as any hand washing behavior practiced after latrine use. This type of regression model was chosen due to the clustered nature of the dataset. Variables tested to be in the model were chosen based on previous studies and current literature on school WASH programs. The variables included in the analysis were: gender, water source (tube-well) at school location, soap availability, water availability at hand washing place, specific place for hand washing, and latrine availability. The variables for water availability at hand washing place, latrine availability, and specific place for hand washing were dropped because through chi-square analysis they were not found to be significantly associated with hand washing behavior. Variables regarding water source on school property (watsource), soap availability (soap), and gender were included in the GEE model.

The GEE model indicates that having a water source on school property and availability of soap for hand washing are the highest determinants of hand washing behavior in primary school children. Additionally, this data shows male students are less likely than female students to practice hand washing. [Table 4.13] The exchangeable working correlation of the GEE model is 0.057.

Table 4.12 WASH Components Association with Hand Washing

Variable relationship with hand washing			
Variable	**Crude OR**	**95% CI**	**p-value**
Water source on primary school property	2.4217	1.1906, 4.9259	0.0121
Soap available at schools for hand washing	2.9500	2.0411, 4.2636	<.0001
Water found in hand washing facility	0.7836	0.4419, 1.3895	0.4032
Male	0.5615	0.3813, 0.8270	0.0033

Table 4.13 General Estimating Equation Model

GEE Model (n=50 schools) (n=626 observations of hygiene behavior) Hand washing= watsource soap hwwater gender				
Variable	**Parameter**	**Standard Error**	**95% CI**	**p-value**
Intercept	-0.3132	0.4315	-1.1589, 0.5324	0.4678
watsource	2.3435	0.8984	0.5826, 4.1044	0.0091
soap	0.9359	0.3300	0.2892, 1.5827	0.0046
hwwater	-1.3205	0.8427	-2.9722, 0.3312	0.1171
gender	-0.5954	0.2450	-1.0756, -0.1152	0.0151

Chapter 5: Discussion

5.1 General Discussion of Findings

Effective hygiene programs promoting hand washing with soap has been found to be successful on many levels in decreasing acute respiratory infection and disease incidence. Programs such as these are most critical in low-resource countries where the burden of respiratory and diarrheal morbidity and mortality is the highest. UNICEF and the Government of Bangladesh has recognized this problem and implemented the SHEWA-B program in order to address this issue. As discussed in earlier chapters the SHEWA-B program is an immense undertaking which has attempted to bring access to improved sanitation, safe water, and hygiene education to 30 million people in Bangladesh.

The primary objective of this thesis was to measure and better understand the current hygiene behaviors among primary school children participating in the SHEWA-B program. Hand washing behaviors among students in Bangladesh have not been previously assessed in the literature, or through the program itself. The secondary objective for this project was to determine the program components that were associated with increased hand washing behavior. This study was designed to be exploratory in nature, and to help advise future research and programming in school hygiene programs.

The study presents a snapshot of the practice of hand washing with soap in primary schools after latrine use in diverse settings across Bangladesh and characterizes the main factors hindering uptake of this behavior. Of the five critical times to wash hands, hand washing after defecation is established as the most consequential time to wash and remove disease causing pathogens. Therefore, this study focused on hygiene behavior after defecation occurred. Although field researchers were unable to confirm whether or not the students had defecated, the use of the latrine is used a proxy to see what behavior would be

practiced if they had actually defecated.

Cross-sectional survey methods were used to collect the data; including a spot check of WASH facilities on school property, surveys with head masters and students, and structured observations of hygiene behaviors. The results of hygiene behavior slightly varied from school to school, but overall hand washing with soap after latrine use was relatively low at 21% among primary school children. Additionally, WASH facilities such as water sources, latrines, hand washing accommodations and soap were found to be adequate in some respects. Almost all of the schools (48/50) possess at least one functional latrine, but lacking in hand washing materials, with only 50% (25/50) of schools having soap available at the place of hand washing. The barriers to proper sanitation and hygiene practices reported by head masters and students had some similarities and some surprising differences that will be discussed later in the chapter.

In order to observed hand washing behavior after latrine use it was necessary for participating schools to have latrines available for student use. Fortunately, 96% of schools had at least one functional latrine, but only 52% of schools had at least one functional latrine that was found open without harsh odors for student use. Female students seem to be the primary users of the latrines with 459 out of the 626 observed students being female. As the age of students increase the more important latrine availability becomes, especially for female students once menses begins. During the data collection, field research officers observed a majority of male students openly urinating and not using the latrine facilities. Culturally, female student require a higher level of privacy and are much more likely to use the latrine to urinate and defecate. Therefore, male students might be less prone to wash their hands with soap if they do not use the latrine.

Latrine use may be a trigger for practicing hand washing with soap since hand washing

stations are generally located close to these facilities. Field researchers did not document the hand washing behaviors of students who urinated or defecated outside of the latrine, so we do not know the accurate rate of hand washing for this group. Latrine use has potential for triggering hand washing behavior, but there is not enough evidence to confirm this claim and further research needs be conducted on this topic.

Of the variables found in the literature to be associated with hand washing, possessing a water source on the school property and soap availability were found to be highly associated with hand washing behavior [Table 4.12, Table 4.13]. Having a water source on school property is necessary component to hand washing, assuming that it is functional and has water available throughout the year. Forty of the 50 schools had a water source on school property, however this study was completed during the rainy season, and according to the survey only 66% of the water sources have water available all year round. According to school staff, the water sources such as tube-wells provide adequate water during the rainy season, but then taper off as the dry season begins. Since over three quarters of the schools (33/40) that possess a water source on school property have a shallow-tube well, this is not surprising because shallow tube wells are unable to reach the lowered water table during the dry seasons.

In terms of water for hand washing, 92% of schools supplied water for hand washing by either using the school water source or filling a water jug or bucket. Despite the frequency of schools with water at hand washing facilities, of the students who were observed after latrine use only 34% washed both hands with just water. Of the ten schools that did not have a water source at the school, water had to be brought in from an outside source for hand washing. Four schools without a water source also did not provide water to be brought in from another source for hand washing. Although this situation is the minority, it represents the stark

reality that a considerable amount of children in primary schools do not have any access to hygiene facilities during school hours.

Additionally, the issue of bringing in water from a river, pond, or nearby water source is problematic for hand washing because it creates another level of barriers for students to access water for hand washing. Ten percent of students reported that one of the reasons they do not wash hands with soap after latrine use is because 'it is difficult to bring water from the water source.' Even when a water source is available, but a bucket or other hand washing device is being used, that means that students or teachers must be responsible to keep water in the device and that creates additional work. This additional responsibility leads to water not being available for hand washing for students if there is no systematic way for the water to be refilled. Having a specific hand washing place or device was not seen to be associated with hand washing possibly due to the issues discussed earlier of refilling water. A majority of schools with a water source used this facility as the main hand washing place (74%).

Students' practicing some form of hand washing was relatively high at 72% among observed students. These results inform us that knowledge of hand washing practices after latrine use or defecation is relatively high, but proper hand hygiene was not practiced. Only 50% of schools had soap available at the main place of hand washing, and 66% of schools had soap either at the main hand washing place or inside the latrine. The limited availability of soap in schools is consistent with the low rates of recommended hand washing practices with soap (21%).

Overall hand washing behaviors were statistically different between schools with soap available and schools without. In schools with soap available for hand washing, the overall hand washing rate of observed students was 80%, compared to 58% in schools without soap. The two groups also had considerably different rates of hand washing with water only. In

schools with soap available, 37% of observed students washed both hands with only water only and in schools with no soap 27% of students practiced this behavior. In schools without soap for hand washing the most practiced form of hand washing was washing only one hand with water at 28%. This data may inform us on the level and quality of hygiene education that is implemented in these schools. The recommended hygiene education program instructs students to wash both hands with soap and water, but when soap is not available it is expected that students will still wash both hands. This also may demonstrate the strength of the cultural norms of washing only one hand that was discussed in the literature review chapter. Given that both groups had at least access to water for hand washing, it was expected that schools with water only would have higher rates of hand washing with only water.

Soap availability in schools was found to be highly associated with hand washing behavior in the analysis of the data. This association was observed in a logistic regression analysis that controlled for student gender, water source on school property, and water availability for hand washing. Surprisingly, in schools with soap available washing both hands with soap was still disappointingly low at 28%. This may mean that students do not have the knowledge to wash their hands with soap, or that they simply are not used to practicing hand washing with soap.

The difference in hand washing behavior seen in schools with soap and schools without soap may be answered by multiple factors. In schools with soap available, schools may be located in an area with a slightly higher socio-economic status, or parents and community members are willing to help fund school programs. Additionally, in terms of school leadership, the school head master in schools with soap available may be more motivated to have a successful WASH program than in schools without. Highly motivated school faculty may lead to better hygiene knowledge and practices as well as increased availability of soap.

More research is needed to fully tease out the differences between these schools.

In the creation of the general estimating equation (GEE) logistic model that adjusted for clustering at the school level, gender, soap and water source in schools, and water for hand washing available, it was clear that soap and water sources in schools were the highest indicators for hand washing behavior among primary school children.

Overall, the study results have demonstrated that hand washing rates are not at ideal rates, there have been considerable improvements made. In schools with a water source and soap available, hand washing rates are significantly higher than in schools without. This information is encouraging, that with improved access to these facilities, hand washing practice rates will increase.

Reported Barriers to WASH Facilities

Although field researchers examined the school facilities and observed hand washing behavior, it is at times more useful to ask the users themselves what they believe are the biggest barriers for themselves. Of the reported barriers to WASH facilities by students and head masters, many interesting issues came up that had not been addressed by the study. When asked about barriers to access soap the number one cited barrier by students and head masters was that students steal or damage the soap. According to both students and faculty, not only students but children not attending school and other community members who have access to school property will take the soap. Soap is a valuable commodity and will be taken by others if it is openly available on school property. Both of these issues can be resolved by the use of a soap container, or another mechanism to protect school soap supplies. One method that has been mention is a box to hold soap where a hand can fit through to apply soap but not big enough to remove the soap from the facility. Similarly, the third most cited barrier was that animals eat or take away soap. We found this situation to be most

problematic in more rural areas where goat, sheep, and other farm animals are on school property.

Lastly, the second highest reported barriers for access to soap were that there is no existing or current fund for soap, and lack of continuous fund for soap supply. The difference between the two barriers is that firstly there is limited funding for soap to begin with and there is no continuous flow of funding to the school for soap supplies. These both bring up the issue of resources and funding for soap in schools. Soap may be affordable for one bar, but to have a continuous supply of soap for hundreds of students at each school can become a challenge.

Students and headmasters were also asked about barriers for not practicing hand washing with soap after toilet use. The students reported that the main barrier was the lack of continuous water at hand washing station, and also a lack of a designated hand washing place. These issues were seen in a large number of schools in the study, especially those that used a bucket or device for hand washing as opposed to the main water source. Head masters on the other hand listed lack of knowledge and lack of motivation as the top two barriers. From the student survey, many students demonstrated adequate knowledge of critical times to wash hands, and therefore there may be just miscommunications between the two groups. It also may be easier for the headmasters to blame students for the problem of water and soap availability that they are responsible for solving.

Head Master Motivation

The study attempted to measure headmasters' motivation through the head master survey. Questioning the head master about what activities he or she has done to ensure that students in their school practiced good hygiene, and if they had a student brigade, were used

as proxy measures for motivation. However, the results were very mixed. When analyzed, there was no connection between higher rates of hand washing and schools where the head master reported more initiative or motivation to have a successful WASH program. Therefore, it is not certain whether this measurement is an accurate representation of the motivation of the head master. Also considering that the head master survey may have introduced social desirability bias since the head masters knew that the researchers were interested in the SHEWA-B program.

Thirty-nine out of forty-nine head masters stated that they developed a student brigade for students to promote hand hygiene in schools and in the community. The next top reported initiatives were arranging for a weekly class on WASH topics for students, and arranging for soap to be available in the toilet and hand washing station. Additionally, only 11 head masters had taken any initiative to overcome the challenge of having a continuous supply or soap. This survey may not have served as an accurate proxy of motivation of school faculty, and other methods will need to be used in future studies to assess motivation. Additionally, given that the schools within the study had different levels of interventions implemented; this may have affected the motivation and/or the rates of hand washing in the participating schools. Head masters and school faculty also may have felt pressured to give answers to the researchers that they believed to be the right answers and included an element of social desirability bias.

5.2 Study Limitations

The study was limited by the small sample size. The study wanted to be able to include different geographic locations that were of interest to the funding organization. Study sites were selected to include as much geographic and socioeconomic diversity of schools in Bangladesh, but due to this aspect more schools were not able to be included because of the

time spent in transit traveling to each new study site. The study was not designed to have the power to be able to assess differences by geographic location, so analysis by area was not attempted.

Additionally, obtaining unbiased data from school faculty and students was difficult because of social pressures during data collection. This problem was experienced in the first upazila that was visited, and that data was not included in the analysis. Self-reported hygiene is prone to over reporting and this was seen in the student survey.

The logistics of the structured observation became another limitation of the study. In latrines with soap and water inside the latrine, it was not possible to observe and record the hand washing behaviors of students. Additionally, when there were many students crowded at the hand washing facility it was not always possible to accurately report the use of soap, if both hands were washed, and hand drying practices. Lastly, this study focused only on hand washing after latrine use and did not include any other critical times of hand washing. This limits the extent to which these results can be inferred to acute respiratory infections. Latrine use was also used a proxy measure of hand washing after defecation since it was not known if the student had defecated in the latrine.

5.3 Conclusions and Recommendations

Conclusion

As discussed in the literature review chapter, schools are ideal for conveying hygiene messages for a number of reasons. First and foremost, with proper hygiene practices in schools after defecation, transmission of diarrheal disease causing pathogens can be interrupted. This is particularly important in school settings where large numbers of children are confined in close proximity provides the opportunity for efficient transmission of infectious agents. Moreover, as proper hygiene practices are learned and used, students are

more likely to pick up the behaviors as habit. Some studies have also shown the potential of school children as facilitators of hygiene behavior in their communities and homes.

Compared to school hygiene in a number of other countries, the facilities in Bangladesh are quite good with respect to the availability of water. However, rates of hand washing with soap are still disappointingly low, which suggests that facilities are not currently being used to their full extent. During the structured observations, the most frequent behavior observed was hand washing with water only, with 34% of observed students practicing this behavior. This demonstrates that the behavior of hand washing is there but needs to be improved upon with better behavior change programs and increased access to soap and water in schools.

The research described here indicates that students generally report being satisfied with their existing latrines, but that there needs to more of them for each school. One problem seen in multiple schools was the issue of once a latrine has been filled; there is no system in place to empty the latrine. In turn, once the latrine is full, either the latrine seal would be cracked and fecal matter brought into the environment or the latrine would be simply closed for use. Thirty-five latrines out of 146 were found to be non-functional and in discontinued use. These issues bring about questions of the sustainability of these facilities, and how can they be improved. Facility spot check at schools and both students and headmasters depict the hand washing facilities to be lacking in schools, but also that the provision of soap becomes problematic due to theft. The main predicament, as it appears in this study, is that a majority of schools have access to adequate latrines and water for hand washing, but there is no mechanism for reliable or long-term access to soap for hand washing.

In order to impact the uptake of hand washing practices among students, barriers to hand washing practice and access to soap and water need to be addressed. Improving current hygiene education materials and refining programmatic approaches will need to be confronted as well to enhance the current hygiene intervention. In terms of improvements for the program as a whole, headmasters emphasized the importance and need of funding for the program, and also to have more support from the implementing organizations such as UNICEF. This issue of support was not delved into, and may need to be fleshed out a little more too truly understand support is needed. Other top cited improvements for the hygiene curriculum included creating teaching materials that are of higher quality in graphics and written content. It was also mentioned that mass media can be used as an innovative tool to extend health and hygiene education from schools into communities and households.

Due to the fact that there is very limited information on current hygiene practices in primary school children, this research is essential in understanding the sanitation and hygiene situation of primary schools in Bangladesh. Given that this research study has to an extent characterized hygiene behaviors in primary schools in Bangladesh, it has also brought about many unanswered questions that will need to be answered in future studies. Interventions aimed at a school can be planned with these baseline findings of the motivations and barriers of students regarding sanitation and hygiene. Overall, the study has shown that there has been progress made, but that there are further opportunities to enhance the SHEWA-B school program. Further information about the motivations and barriers for students to practice hand washing with soap after defecation can be gained through future investigations.

[1]Recommendations:

1. Physical Facilities and Environment

[1] *Recommendations developed in collaboration with ICDDR, B and LSHTM

Ultimately, the largest barrier described by study participants and found in all surveys was the need to provide and maintain adequate sanitation and hand washing facilities for students. To approach the situation regarding non-functional and abandoned latrines once they had become full would be to suggest a system to empty the latrine or install more sustainable technology. Newly installed latrines should be sustainable double-pit latrines as they can be used for a much longer period, with one pit composting while the other is in use.

In regards to the lack of continuous access to water for hand washing and latrine use, a mechanism for ensuring water availability should be examined. In schools without a water source on school property, this can become a larger issue. For schools with limited water availability, a tank for collecting rain water or storing larger amounts of water may ameliorate the burden of student or faculty collecting water every day from far way sources, and increases the likelihood that water will be available. In schools with a water source, an enforced systematic procedure for continuously supplying water for these activities needs to be considered. For example, the student hygiene brigade or a few new students each week are responsible for gathering water from the tube-well or other source in the morning for the hand washing station and inside the latrine. Additionally, in order to easily wash both hands at once have proper hand a hand washing station with a drum and tap (Appendix 5) may be use useful for younger children. Given the diversity of school set-ups there is no one recommendation that will be well suited for each situation, but they can be tailored to each location.

To address the issue of insufficient access to soap during hand washing, taking measures to decrease and control theft and waste of soap would improve access. It is suggested that school authorities include soap in the yearly planning budget so that funding may be set aside for these specific materials. Community leaders and school supervisors may

work together to explore new venues to acquire funding for their school hygiene program. Bar soap can incur increased cost due to theft and waste, this can lead to soap being kept away from hand washing stations and decreasing accessibility. Students may not feel comfortable asking to use soap, and therefore will not be able to practice proper hand hygiene. Alternatives to bar soap that are suggested are to create a soap dispenser with a plastic bottle and have it attached to the hand washing area. (Appendix 6 & 7) These measures will prevent theft, and a smaller amount of soap will be needed to implement this product. More research of this technology in school setting will be needed to determine the acceptance by students.

2. School Logistics

In schools with hundreds of students vying to use on average two latrines, there is a problem with crowding and inaccessibility during class breaks. This time is given for all students to use the facilities, but there are not enough latrines or places for hand washing adequately provided for the number of students. A simple improvement may be to easily stagger class breaks, possibly by age group, and decrease the number of students using the facility at one time. In addition, placement of hand washing stations or water sources need to be in close proximity to latrine facilities as to increase likelihood of students washing their hands with soap.

3. Media and Health Messages

Students emphasized the potential for using media to encourage proper health behaviors. The current school hygiene program may want to include motivational messaging that focuses on emotions and social norms as opposed to traditional information on health benefits. Motivational messaging that addresses disgust, social norms, and increased social benefit may be more effective for students. Students and headmasters discussed the

possibility of including different methods and materials for hygiene education, such as interactive games, videos, and plays.

By including prominent celebrities such as cricket players or actors to convey these key hygiene messages may also help reenergize the program and lead to improved practices in the community as well.

4. Engagement of the Community and Local Government.

Establishing partnerships with community based organizations and families would be an increasingly positive measure to take in order to increase the reach of hygiene programming. Headmasters suggested that by combining school and community sanitation and hygiene educations, it is more likely that students and guardians will receive consistent messages. Despite the current household component of the SHEWA-B program, more can be done to improve communication between community led activities and the school WASH programs. This issue is critical to address if it is expected for students to continue practicing proper hygiene behaviors learned in school in their homes.

Further Research

Further research that may be extended from this project could be to investigate the hygiene practices on the other four critical times of hand washing and see if there are similar results that arise. Additionally, it would be interesting to determine whether or not latrine use is a trigger for hand washing with soap, and to look into other trigger behaviors that improve hand washing rates. Hand washing could also be measured by incorporating different methods such as soap with sensors inside and video observations might be implemented to test reactivity within this study.

Improving hand hygiene among children is a relatively cost effective method that has potential to substantially decrease child mortality and morbidity. Leading researchers have

even gone so far to stipulate that with appropriate hygiene interventions it is possible that one million children could be saved (Bowen et al. 2007). This research study contributed a small amount of knowledge to the ongoing effort to prevent child deaths, but it is a step in the direction to learn and understand the mechanisms needed to improve hand washing with soap among primary school children.

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Appendix 1: Section of the Structured Observation Instrument

	Time of observation 11-12……..1 12-12.30…2 12.30-1.30..3 1.30 - 2.00..4	Gender Male..1 Female ..2	Did wash hands? Yes..1 No…2 Not possible to observe …..3	Did wash both hands? Yes..1 No…2 Not possible to observe …..3	Hand washing materials Soap/detergent…1 Ash/mud..2 Water only.. 3 Not possible to observe..4 Others…9	Hand drying Air…1 Not dried..2 Clean towel….3 Dirty towel……4 clothe that is wearing …5 Others …9	Place of handwashing School corridor……1 School yard (within 3 steps of latrine)……..2 School yard (within 3 to 10 steps of latrine)…….3 Out of school yard (More than 10 steps from the school yard)…….4	Source of water for Handwashing Main water source of the school……..1 Specially designed Hw devise(Drum with a tap)……..2 Tap w/o bowl…….3 Water container(Bucket, water pot)……..4 Others ……..77	Did you observe any open defecation Yes..1 No…2 Not possible to observe …..3
Col=1	Col=2	Col=3	Col=4	Col=5	Col=6	Col=7	Col=8	Col=9	Col=10
1									
2									
3									

3 [Time of departure (24 hrs)]: □□:□□

Supervisor: **Interviewer:**
Signature: **Signature:**

Date: **Date:**

Appendix 2: Latrine Portion of the Physical Survey of School Facilities

[No. of latrine]	**3.1 [What kind of toilet facility do students usually use?]** (fill in the appropriate code from the list below after visiting all the latrines)	**3.2 [Latrine User]** [Girl's latrine].....1 [Boy's latrine].....2 [Teacher's latrine].....3 [Non specific].....4 [Other(Specify)].....77 (See if in the door of the latrine the target user is mentioned. Confirm by asking the teacher)	**3.3 [Is there a door on the latrine ?]** [Yes].....1 No].....2 **)** (Observe only)	**3.4 [Is the latrine open?]** [Yes]...1 [No].....2 (Observe only)	**3.5 [Is the latrine functional ?]** Yes]...1 [No].....2 .....99 (Observe only)	**3.6 [Is here stool visible on the slab or floor of the toilet facility ?]** [Yes]...1 [No].....2 (Observe only)	**3.7 [How does the toilet facility smell?]** [No smell]...1 [Slightly bad smell].....2 [Very bad smell].....3 (Observe only)	**3.8 [Is water available in the toilet facility ?]** [Yes]...1 [No].....2 (Observe only)	**3.9 [If Yes, specify:]** [Tap].....1 [Bucket]...2 [Bodna].....3 [Other(Specify)]..77 (Observe only)	**3.10 [Are there any other anal cleansing materials available in the toilet facilities?]** [Toilet paper].....1 [Cloth].....2 Ash.....3 Mud.....4 [Other(Specify)].....77 (Observe only)	**3,11 [Is there soap available inside the toilet facility ?]** [Yes]...1 [No].....2 (Observe only)
a.											
b.											

[Time of departure (24 hrs)]: □□:□□

Supervisor:
Signature:
Date:

Interviewer
Signature:
Date:

Appendix 3: Portion of the Student Survey

Student Survey: Access and Use
Formative research in Bangladesh for SHEWA-B 2010

Objective: To determine the factors in the physical environment favoring or discouraging hand washing with soap in schools.

Instructions:

- [Four students will be chosen randomly from each school and will be asked to participate in the student survey]
- The survey will take place after the physical survey of the facilities and survey of the head master]
- [One girl and one boy will be chosen randomly from grade 4 and grade 5]
- [The student roll list will be obtained from class 4 and 5 and one girl and one boy will be chosen from each class]
- [Students will be taken outside of the classroom and given the questionnaire individually]
- [Students will be given the questionnaire in a semi-private area away from other students and teachers to ensure confidentiality]
- [Girls and boys will be separated in order to reduce social desirability issues]

	Section 2.00: Demographic Information	
2.01	[Sex] [Male]……..1 [Female]……2	
2.02	[How old are you?]	[Age] _____
2.03	[What class are you in?]	[Class] _____

	Section 3.00: Access & Use of Toilet Facilities	**Code**	**Code**
3.01	*[Where do girls usually go to defecate at school? (Multiple responses possible)]*	[School latrine]……1 [Public latrine nearby].....2 [Latrine at home or at neighbor's house]……3 [Bush / field]……4 [On school grounds] ……..…5 [Other (specify)] ……..…6 Don't know]…… 9	
3.02	*[Where do boys usually go to defecate at school? (Multiple responses possible)]*	[School latrine]……1 [Public latrine nearby].....2 [Latrine at home or at neighbor's house]……3 [Bush / field]……4 [On school grounds] ……..…5	

		[Other (specify)] ……..6 [Don't know]…….. 9	
3.03	*[Where do girls usually go to urinate at school? (Multiple responses possible)]*	[School latrine]……1 [Public latrine nearby].....2 [Latrine at home or at neighbor's house]…….3 [Bush / field]……..4 [On school grounds] ……..…5 [Other (specify)] ……..6 [Don't know]…….. 9	
3.04	*[Where do boys usually go to urinate at school? (Multiple responses possible)]*	[School latrine]……1 [Public latrine nearby].....2 [Latrine at home or at neighbor's house]…….3 [Bush / field]……..4 [On school grounds] ……..…5 [Other (specify)] ……..6 [Don't know]…….. 9	
3.05	[How many latrines are there for students to use?]	_____ [# latrines]	
3.06	[How many latrines are for use for only girls and only boys?]	a._____ [# latrines for girls] b._____ [# latrines for boys] c._____ [# latrines for boys and girls both]	
3.09	[What was the reason for not being able to use the school toilet)]	***[Mention 1, Not mention 0]*** a | [Latrine out of order] b. |[No water available] c. [latrine was closed] d. [Dirty latrine] e. [Occupied by others f. [No door] g. [Other] [specify] _____	

4.06	*[What is the most common reason that soap might not be there?]*	***[Mention 1, Not mention 0]*** a. [Students steal it] b. [It has not been purchased] [Teachers did not make any available] c. [Eaten by animals] d. [Get's used up quickly] e. [Other (specify)]_____
4.07	*[Where do you usually wash your hands after defecation at school?]*	1. [Tube Well] 2. [Inside Toilet] 3. [Hand washing station] 4. [pond/river] 5. [Out side of toilet with bucket, water pot] 6. [Don't wash] [Other (specify)]_____
4.09	[What is the most common reason you don't wash your hands at school?	***[Mention 1, Not mention 0]*** a. [No place for handwashing] b. [No water at the handwashing place] c. [No soap] d. [Not needed] e. [Shortage of time] f. [Other (specify)]_____

[Time of departure (24 hrs)]: ☐☐:☐☐

Supervisor:
Signature:
Date:

Interviewer:
Signature:
Date:

Appendix 4: Portion of the Head Master Survey

Survey for Head Master-Teacher
Formative research in Bangladesh for SHEWA-B 2010

[Note: If the Head Master is unavailable for questioning, ask to speak with the teacher in charge]

Objective: [To determine hygiene curriculum and understand the SHEWA-B project implementation in schools]

Instructions:

- [FRA will ask the head master or teacher in charge if they may ask them a few questions]
  [The FRA will then ask if they can sit in a private area]
  [The FRA will go through the survey with the head master and ask to see certain items that are covered in the survey]
- [This survey will be completed at last among the 4 intruments

	Question	Type of Code	Code
2.1	[How many students do you have in the school?]		
2.2	[Number of boys]		
2.3	[Number of girls]		
2.4	[What are the activities you have done to ensure the students practice good water, sanitation and hygiene behaviors?]	**[Mention 1, Not mention 0]** a. [Developed yearly plan that includes water, sanitation and hygiene agenda] b.[Developed school brigade] c. Arranged for special hand washing device(a drum with a tap)] d. [Arranged for soap in the toilet/HW station] e. [Sent the student brigade to the community] f. |[Arranged for weekly class on hygiene for students] g. [Arranged for students to borrow books]	

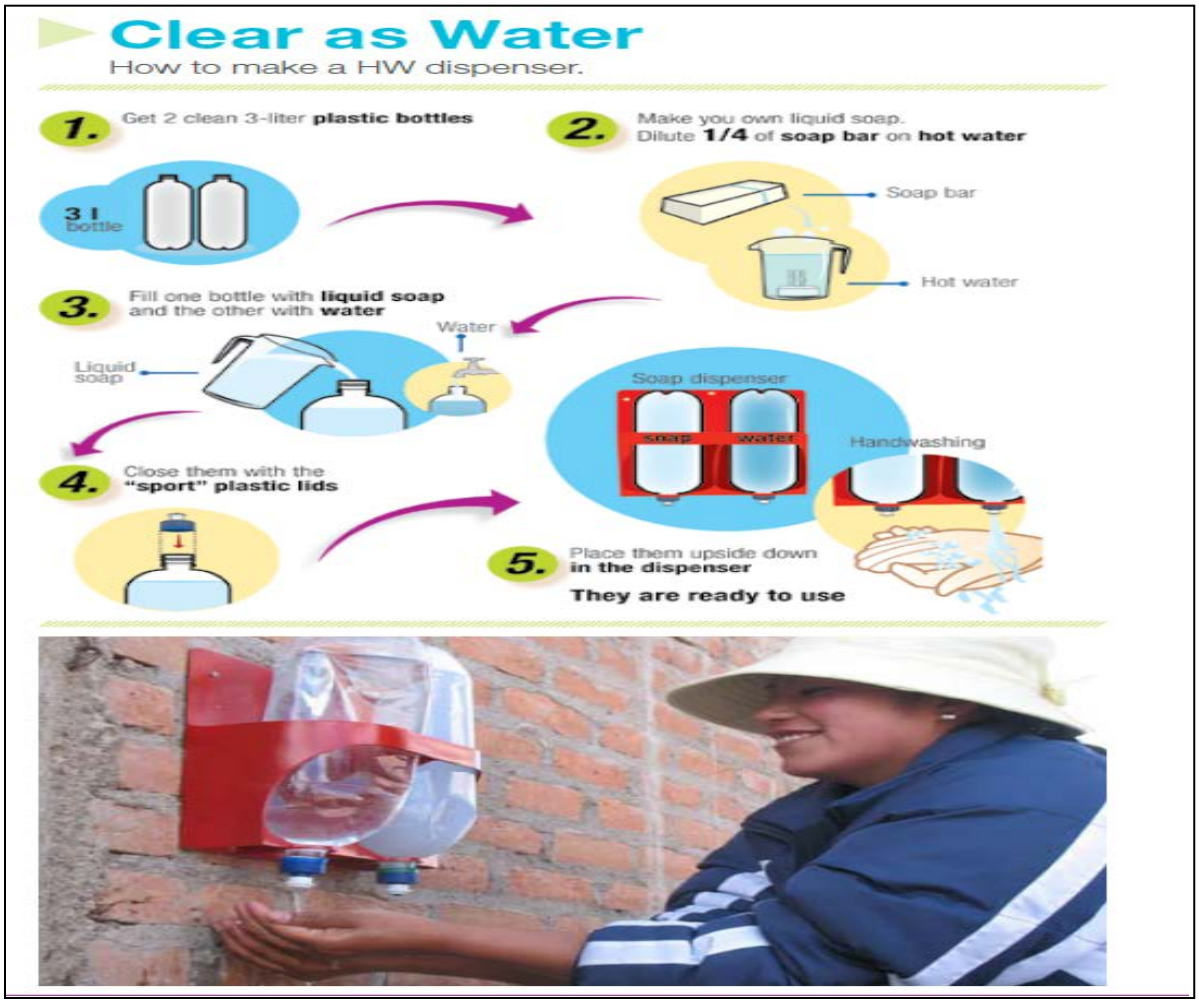
		h. [Arranged for regular meetings with the teachers and students] i. [Have mentioned about this issue in the SMC meeting.] j. [Other] [specify] _____	
2.5	Does your school yearly plan have water sanitation and hygiene issues included?((Ask only)	[Yes] ……1 [No]……..2 ***2.7*** [Don't know]…….99 ***2.7***	
2.22	[What component of the SHEWA-B project has your school received and has been implemented?] (More than one answer may be selected)	**[Mention 1, Not mention 0]** a.[Training of all the teachers and SMC b.[Program curriculum and materials on hygiene] c. [Toilet] d. [Water point] e. [Repair of existing WASH facilities] f. [None] g. [Other] [specify] _____	

3.01	What are the reasons/barreirs for students not always washing hands with soap after defecation]	**[Mention 1, Not mention 0]** g. [No designated place for handwashing] h. [Lack of continuous water availability at the handwashing place] i. [Lack of continuous soap availability at the handwashing place] j. [Fewer HW place compared to student number] k. [Lack of Knowledge]	

		l. [Lack of motivation] m. [Shortage of time] n. [Other (specify)]_____ o. [N/A].	
3.02	***[How can we overcome this barriers/reasons?]***		
3.04	*[What is the most common reason that soap might not be there?]*	***[Mention 1, Not mention 0]*** f. [Never supplied as no fund for soap] g. [Students steal it] h. [Lack of continuous fund for buying soap] i. **[**Teachers did not make any available as students waste soap] j. **j** [Eaten by animals] k. [Get's used up quickly because of lot of student] l. [Other (specify)]_____	
3.05	*[What is your suggestion to ensure continuous supply of soap at designated HW station ny overcoming the above mentioned barriers.]*		
3.07	*[What are the reasons for not having water in the handwashing station]*	***[Mention 1, Not mention 0]*** a. [Water source out of order] b. [No staff available to pour water in handwashing device] vailable] c. Students forget to pour water in the hand washing station]	

		d. vq| [Too many students] e. [Other] [specify] _____ f. **c** [N/A].	
3.08	***[What can be done to ensure continous supply of water at the designated HW station]***		
3.09	***[Have you done anything to ensure continuous supply of water at the hand washing station? If yes what are the 3 main initiatives?]***	[Yes].....1 [No].....2	
3.10	[What are the reason s for students not being able to use the school toilet)]	***[Mention 1, Not mention 0]*** a. [Latrine out of order] b.[No water available] c. [latrine was closed] d. [Dirty latrine] e. [Too many students] f.[No door] g. [Other] specify] _____ **h.** [N/A.	

Appendix 5: Hand washing Station for Schools



UNICEF, 2011

Appendix 6: IRB Forms

EMORY UNIVERSITY

Institutional Review Board

March 21, 2011

Loida Erhard
MPH Candidate 2011
Rollins School of Public Health
Emory University

RE: **Determination:** No IRB Review Required
School Study Dataset (UNICEF-SHEWA-B) Thesis Project
PI: Loida Erhard, BS Dear Ms. Erhard:
Thank you for requesting a determination from our office about the above-referenced project. Based on our review of the materials you provided, we have determined that it does not require IRB review because it does not meet the definition of "human subjects research" or the definition of "clinical investigation" as set forth in Emory policies and procedures, as well as in federal regulations.

Specifically, in this project you will be performing secondary data analysis on data collected for the UNICEF- SHEWA-B project at the International Center for Diarrheal Disease Research, Bangladesh (ICDDR,B). The owners of the data have provided a written statement that the information they will provide will be de- indentified and that you will not have access to any links or codes to access identifiable data. As such, this project does not meet the definition of using "human subjects" as defined in 45 CFR 46.102(f).

This determination could be affected by substantive changes in the study design, subject populations, or identifiability of data. If the project changes in any substantive way, please contact our office for clarification.

Thank you for consulting the IRB. Sincerely,

Sean Kiskel
Research Protocol Analyst
Emory University IRB
This letter has been digitally signed

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