HAND WASHING PRACTICES OF HISPANIC WOMEN IN A COMMUNITY HEALTH SETTING

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ABSTRACT

Cynthia Dawn Lee: Hand Washing Practices of Hispanic Women in a Community Health Setting
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Hand washing is one of the most significant ways of preventing infections (CDC, 2011). This project evaluated current hand washing practices of a group of adult Hispanic women that attended a federally qualified community health center in eastern North Carolina.

This project assessed participant's hand washing practices, knowledge, attitude, and beliefs using a modified tool. Following observation of their current hand washing practice, the Centers for Disease Control's (CDC) (2014) recommended hand washing technique was taught. Approximately four weeks after the intervention, the same tool was administered via telephone, to evaluate the impact of the intervention. Data were analyzed using measures of central tendency, frequency, correlations, and regression.

Sixty (n=60) Hispanic women initially participated and thirty-three (n=33) completed the telephone follow-up. Ages ranged from 18 to 79 years old with an average of 33.3 years. Thirty-three percent of the women had only an elementary education. The average household size was 4.53 people, with an average of 2 children, and 20% per were pregnant. All participants reported a household income of less than $20,000. All had lived in the United States (US) $\geq$ 3 years; 93% were in the US > 5 years.

All participants acknowledged the use of soap for hand washing. The average time of initial hand washing was 19.68 seconds. The 2nd hand washing following education and

demonstration (n=39) increased from 19.46 to 29.95 seconds: a difference of 10.49 seconds.

With multiple linear regression, a statistically significant relationship was found between self-reported number of hand washes per day pre- and post-intervention with pregnancy (p= 0.007 and .01, respectively) for participants that completed the project.

Hispanic women in this project had good knowledge of hand washing. Despite their low-income status and minimal formal education, they were in compliance with CDC (2014) guidelines for hand washing. Since a reported increase in hand washes of pregnant women was significant, this could assist in the prevention of infections especially within the context of maternal-infant care.

This project reinforced CDC recommendations for proper hand washing to decrease disease transmission. Reinforcing their knowledge and skill encourages the continuance of proper hand hygiene.

To God, my family and friends --
Your love and encouragement has sustained me.

To my beloved parents -- this is for both of you.

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To my committee -- thank you for guidance, challenge, and perseverance.
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LIST OF ABBREVATIONS AND SYMBOLS

β	Regression Beta Coefficient
CDC	Center for Disease Control
CINAHL	Cumulative Index to Nursing and Allied Health Literature
DNP	Doctor of Nursing Practice
EMBASE	Excerpta Medica Database
ERIC	Education Resource Information Center
FQCHC	Federally Qualified Community Health Center
HW	Hand Wash (ing, es)
IFH	International Scientific Forum on Home Hygiene
IRB	Institutional Review Board
LILACS	Literatura Latino Americana en Ciências da Saúde
MEDLINE	Medical Literature Analysis and Retrieval System Online
n	Number in Sample
NC	North Carolina
p	P-value
PUBMED	Public/Publisher MEDLINE
SCIELO	The Scientific Electronic Library Online
SD	Standard Deviation
UV	Ultra-Violet
US	United States
WHO	World Health Organization

CHAPTER 1: SIGNIFICANCE AND BACKGROUND

Introduction

Preventable infectious disease is one of the leading causes of death throughout the world. According to the Centers for Disease Control and Prevention (CDC), influenza and pneumonia (two infectious diseases) were the 8th leading cause of death in the United States (US) in 2012 (Heron, 2015). For that same period, the World Health Organization (WHO) reported that diarrheal disease, another infectious disease, was the 7th leading cause of death in the world. Even though the number of deaths from diarrheal diseases decreased from 2.5 million in 2000 to 1.5 million in 2012, the prevalence remains high (WHO, 2015). Unfortunately, there is an unequal effect of infectious disease on health throughout the world (Curtis, Danquah, & Aunger, 2009). The global burden of hygiene-related diseases, such as gastrointestinal, respiratory, skin, wound and eye infections, has a persistent toll on the health and prosperity of the global community due to outbreaks in homes and settings of everyday life (Bloomfield, Exner, Signorelli, Nath & Scott, 2012). With the H1N1 influenza pandemic in 2009, outbreak of Ebola virus in 2014, the influenza epidemic for the 2014-15 season, and measles outbreak in 2015, there is an increased need for awareness related to hand washing and disease prevention (Davison, 2015; SteelFisher, et al., 2015).

Hand washing with soap and running water is one of the most significant ways of preventing infections (CDC, 2011). The CDC (2011) proposes that using soap to wash hands is more effective than using water alone because surfactants in soap aid in lifting soil and microbes

from the skin. Hands are scrubbed more thoroughly with the use of soap, thereby removing more germs.

Critical times to wash hands, per the CDC (2014), to prevent the transmission of infection include: during all stages of preparing/handling food; before and after contact with body fluids/wounds or sick individuals; after using the toilet, changing diapers or helping a child with toileting; after coughing, sneezing or blowing one's nose; after touching animals, their food or waste; and after handling garbage (CDC, 2014; see Appendix 1 and Appendix 2). The CDC recommendations that proper hand washing include the use of running water, lathering with soap, and scrubbing of hands, under fingernails and between fingers for at least 20 seconds. Finally, hand should be dried "using a clean towel or air-dry" (CDC, 2014; see Appendix 1 and Appendix 2).

The WHO (2013) suggests that simple hand washing alone could save approximately one million lives per year. For example, there is roughly a 48% decrease in risk of diarrheal disease when hand washing is done with soap (Craincross et al., 2010). However, the occurrence of hand washing with soap at appropriate times continues to be globally low (Curtis, Garbrah-Aiddoo & Scott, 2007). Although observed hand-washing compliance has improved over recent years, from 77% in 2007 to 85% in 2010, there remains considerable opportunity for improvement (American Society of Microbiology, 2010). With the introduction of hand sanitizers and cleaning wipes, traditional hand washing with soap has diminished and been replaced with use of these surrogates (CDC, 2002; WHO, 2005). However, no product can replace the effectiveness of hand washing with soap in regard to specific disease prevention (Oughton et al., 2009).

Problem Statement

There is a need to understand hand washing practices in the populations where one works in order to reduce infections and mortality from infectious diseases. According to the World Health Organization's Sanitation Challenge, women bear the primary responsibility at the household level for water, sanitation, and hygiene in most cultures (WHO, 2013). Women also have an influential and crucial role in hygiene behaviors of young children. Mothers and caregivers are the common target for behavior change campaigns because they have the greatest influence on children's health (Sanitation Hygiene Applied Research for Equity, 2011). Thus, learning more about women's hand washing practices and knowledge, developing innovative ways of reinforcing the importance of hand washing with soap versus use of a surrogate method, and providing education about how to properly hand wash with soap is of paramount importance to global health (Reddy & Snehalatha, 2011).

Since many approaches, programs, and campaigns to increase hand washing have unknown effectiveness, it is important to understand the barriers to hand washing from a socio-cultural prospective. Curtis et al. (2009) believed that accounting for and embracing emotional, habitual, and cultural factors that may underlie hand washing behavior is necessary to change behaviors related to hand washing in any population.

Between 1980 and 2010, the Hispanic population in the United States (US) increased 246 percent, from 14.6 million to 50.5 million persons. Growth in the Hispanic population has concentrated in non-metropolitan communities, particularly in the Southeast and Midwest, since 1990 (United States Department of Agriculture, 2013). This is likely due to the presence of agricultural jobs in these areas (United States Department of Agriculture, 2016). Since Hispanics are currently the largest and most rapidly growing minority group in the US (Larson,

Ferng, Wong-McLoughlin, & Wang, 2009), and in North Carolina (NC), women from this ethnic group were targeted for this project.

Project Purpose

The purpose of this project was to evaluate current hand washing practices of a group of Hispanic women that attended a federally qualified community health center (FQCHC) in eastern North Carolina with a high percentage of Hispanics. The evaluation included behaviors, knowledge, attitude, and beliefs regarding hand washing. This project assessed hand washing practices, taught CDC's recommended hand washing technique, and included a follow-up assessment to evaluate the impact of the intervention.

CHAPTER 2: REVIEW OF LITERATURE

Search for Literature

Literature searches were performed throughout the entirety of this project with consultation from the University of North Carolina at Chapel Hill's Health Science librarians on 2/4/2014 and 10/26/2015. Searches of all major databases were completed with the librarian, and independently for additional articles on the topic of Hispanic women and hand washing. Databases included PubMed (Public/Publisher MEDLINE [Medical Literature Analysis and Retrieval System Online, US National Library of Medicine Life Science database]), CINAHL (Cumulative Index to Nursing and Allied Health Literature), Proquest Health Management, EMBASE (Excerpta Medica Database), Global Health (Public Health Database), Scopus, Web of Science, ERIC (Education Resource Information Center), Google Scholar, SciELO (The Scientific Electronic Library Online [Brazilian Database]), and Lilacs (Literatura Latino Americana en Ciências da Saúde [Latin American and Caribbean Health Sciences Literature]). Search terms used in boolean/phrase for the first search were ((hand AND (washing OR sanitizing OR hygiene)) OR hand washing) AND (hispanic* OR latin*). Search terms used in boolean/phrase for the second search were (("hand washing" OR "hand hygiene" OR handwash*)) AND ((latina OR hispanic*)). In SciELO and Lilacs database search terms were ("hand washing" OR "hand hygiene" OR handwash*) AND (communit* OR public).

Inclusion criteria for the searches were any terms related to hand washing or hand hygiene, latina or hispanic, or community and/or public. Inclusion criteria included dates from 2008 to present (5 years previous to 2013, when the project was conceived). Exclusion criteria

were age less than 18 years old, any pediatric terms, or any type of settings such as food service (restaurants or cafeterias), daycares, healthcare institutions (hospitals, skilled nursing facilities, assisted livings, hospices, medical offices, or home health).

Hygiene and Health

The modern term of hygiene refers to cleanliness and any practice that seeks to eradicate or reduce harmful infectious agents (WHO, 2015). Hand hygiene encompasses many terms such as hand washing with or without soap, hand rubbing with sanitizers, or other forms of detergent, and surgical antisepsis (Jumaa, 2005). In 2012, the International Scientific Forum on Home Hygiene (IFH) formulated an approach to home hygiene, known as targeted hygiene. The basic aim of targeted hygiene was to prevent the transmission of infection; infection cannot spread if the chain of infection is broken (Bloomfield & Scott, 2013). Recognizing that hygiene may differ between low and high income communities, or developed compared with developing countries, the IFH acknowledged that the largest collection of data for efficacy of hand washing came from studies in developing countries while the majority of the microbiological data came from homes in developed countries (Bloomfield et al., 2012). Therefore most of the studies on household hand washing practices were from developing countries, with microbiological data from developed countries.

Hand Washing Knowledge and Practice in Developing Countries

Hand washing in the community and household practices has been extensively studied in developing countries, especially on the continents of Africa and Asia. Rabbi and Dey (2013) performed a cross-sectional comparative study in Bangladesh, South Asia, in which surveys were taken regarding knowledge of critical times to hand wash and when hand washing was practiced. The sample size was 30,000 households, 600 from each of 50 study sub-districts for three rounds

of sampling (baseline, midline, and end-line). A total of 29,985 households were surveyed at baseline, 29,885 at midline and 26,404 households at end line. Only the matched households from the three consecutive surveys were considered for comparison, hence the lower number at the end point. Critical times for hand washing were identified as before eating, after defecation, after cleaning the bottoms of babies, before feeding babies, before cooking and before serving food. Options for hand washing practices were one hand with only water, two hands with only water, one hand with soap, two hands with soap, one hand with soil, two hands with soil, one hand with ash, two hands with ash, and no washing. A gap was identified between hand washing knowledge and practice with soap at critical times, as 90% of participants had knowledge of hand washing with soap before eating and after defecation. However, only 21% reported doing so before eating and 88% reported doing so after defecation. Participants believed that washing their hands with only water before eating was sufficient to clean their hands.

Similar findings were demonstrated in a randomized observational and cross-sectional study by Halder, Tronchet, Akhter, Bhuiga, Johnston, and Luby (2010) where most of the study subjects only washed their hands with water, believing that water was a potent purifying agent. The sample was selected randomly from 100 villages within 36 districts in rural Bangladesh, South Asia. Structured observations were performed in 1000 households, and a cross-sectional assessment in 1,692 households, which included spot checks, evaluation of hand cleanliness and a request for demonstration of usual hand washing practices after defecation. Hand washing with soap was performed 14% of the time after defecation and 21% of the time after cleaning a child who had defecated. Mothers/female caregivers were most common among household members to wash both hands with soap, which was observed to occur approximately 33% of the

time as compared to their reported behavior of 47% of the time and demonstrated behavior of 51% of the time.

Ray, Zaman and Laskar (2010) performed an intervention study in two Eastern states of India, West Bengal and Tripura. The study area in West Bengal was an urban slum of the Sibpur area (Howrah district) where the water supply was intermittent tap water. The study area in Tripura was an urban slum of South Chandrapur area (Agartala Township) where the water supply was from ponds, tube wells, and wells. The sample size was 100 households, where simple random sampling selected the first household and a consecutive selection of households until 100 were achieved. In both study areas, almost all the respondents performed hand washing after defecation using soap or ash and water. However, in both areas, hand washing was not performed by a substantial proportion of participants in situations such as after changing diapers, disposing of the feces, before preparing food, after handling raw vegetables, or after handling pets or domestic animals. Significant improvement in hand washing with soap was seen after use of a stopwatch to time of hand washing and review of the six steps of hand washing.

Briere et al. (2012) distributed hygiene kits in Western Kenya, including WaterGuard sodium hypochlorite solution for home water treatment, soap, and pictorial education materials to mothers while children received their pentavalent and oral polio vaccine in Homa Bay district. The Suba district, which received no hygiene kits, was used for comparison. Caregivers were interviewed from 1,361 households in Homa Bay and 1,139 in Suba at baseline. At follow-up, a standard questionnaire was used in 2,361 households in Homa Bay and 1,033 in Suba. A random subsample of 447 respondents in Homa Bay and 368 in Suba were selected at baseline. Eight hundred respondents in Homa Bay and 314 in Suba received an expanded questionnaire at

follow-up. In Homa Bay, there was a significant improvement in hand-washing technique from 25% at baseline to 51% at follow-up ($p < .0001$), and an increase in use of soap from 89% at baseline to 92% at follow-up ($p = .04$). In Suba, there was no statistically significant relationship found for hand washing technique from 27% at baseline to 34% on follow-up or presence of soap at 90% from baseline to follow up. This study showed that incentives and education could increase the rate of hand washing, as well as water treatment, and immunizations. The initial steps of behavior change began with the acquisition of knowledge.

The aforementioned studies revealed a disconnection between actual behavior, reported behavior, and knowledge of hand washing with soap. Additionally, sustainability of changed and improved hygiene behavior over the long term remains in question (Ray et al., 2010).

Curtis, Danquah and Aunger (2009) conducted 13 studies in 11 developing countries to design large-scale hand washing promotional programs to child caregivers in domestic settings. The studies were conducted in the African countries of Ghana, Kenya, Madagascar, Tanzania, Uganda and Senegal, along with the Kerala State in India, Kyrgyzstan, Vietnam, and the Sichuan and Shaanxi Provinces of China within Asia. Additionally, one study was conducted in Peru, South America. Several methods were used to assess the cultural view of hand washing behavior. Hand washing rates of child caregivers (usually mothers) were directly observed at critical points. Hand washing with water only was on the average three times higher than hand washing with soap. An average of only 17% of caregivers ($n = 3,379$) washed their hands with soap after defecation/going to toilet, while 45% ($n = 2,799$) used water alone after defecation/going to toilet.

Classification of Hand Washing Behaviors

The Curtis et al. (2009) study, further classified hand washing behaviors as habitual, motivated, or planned. *Habitual* hand washing was considered the most primitive behavior, which was a learned, automated behavior triggered regularly by particular cues. For example, within the Asian, African, and South American culture, hand washing habits of mothers were attributed to what they were taught when they were young. Mothers like to teach their children good habits. If habits were established in childhood, then they tended to become a part of the daily routine.

Motivated hand washing was characterized by hand washing with soap due to feelings of disgust, comfort, nurture, status, affiliation, attraction, and fear (Curtis et al., 2009). In all of the Curtis et al. studies (2009), disgust was manifested has a motivator for hand washing because hands had to be washed when contaminated with organic matter that was foul, smelly or dirty. Disgust was directly related to status and affiliation because one could not be considered dirty and disgusting and still be accepted or respected in society. Comfort emerged as a motivator for hand washing in all studies, as it related to being fresh, confident in being ready for anything and pure. Nurture was seen due to this study's population being caretakers of young children. Women placed their children's health and well-being first, and loving and caring for them was rewarding and a source of great pleasure and satisfaction. A keen sense of responsibility and duty was felt among these women to have smooth functioning families, and healthy and properly educated children. Priority was given to making sure that children had good manners and were good members of society. Being clean was seen to enhance social status, respect, and admiration. In contrast, being dirty was thought to be shameful and thus to be avoided. Since hand washing with soap was usually a private affair and others could not tell if it was performed,

hand washing with soap was a social matter, and needed to be performed at public functions or in restaurants, but not necessarily at home. Affiliation, or being a member of a desired social group, drove conformity behavior to perform local social norms. An important motivation for hand washing was by joining in and behaving in the same manner of those in the social group. Attraction was not entirely plausible, although one caregiver in Kenya mentioned “You cannot caress your husband when your hands are dirty" (Curtis et al., 2009, page 663). Fear was related more to times of epidemics such as cholera or typhoid, with an increase in hand washing performance during outbreaks especially within Peru, Uganda, Kenya and Senegal. Diarrhea was not seen as a disease process but more as a symptom and therefore was not perceived as a cause for fear. Because diarrhea was not seen as life threatening and thought to be mild and self-limiting, hand washing with soap was not considered beneficial in prevention.

Planned hand washing behavior could help achieve a long-term objective. By hand washing, a platform of good health could be provided for all the family. Hand washing at specific times was performed to be in a state of religious purity or good luck, which was planned to satisfy a supernatural objective. Caretakers planned to teach children hand washing to socialize them correctly for future success. A deficit in knowledge and belief about hand washing with soap was seen to "break the chain" for valuable and long-term social outcomes (Curtis et al., 2009).

Role of Friends and Relatives

In Malawi (East Africa) Russo et al. (2012) distributed hygiene kits that included a water storage container with cover, bottle of WaterGuard (sodium hypochlorite solution for home water treatment), bar of soap, and educational materials to pregnant women at their first antenatal clinic visit in two districts in Malawi. Refills of WaterGuard and soap were provided up to three

additional times during subsequent antenatal, delivery, or postnatal visits. Several visits were made by clinic workers to hygiene recipients (n = 275, 155 from Blantyre and 120 from Salima) throughout the program and included visits with friends and relatives (n = 386, 230 from Blantyre and 156 from Salima). The intent of the study was to observe behavior changes among the friends and relatives, which was in fact noted both with use of WaterGuard and hand washing with soap. Soap in the home was observed initially in 68% (n = 184, 112 in Blantrye, 72 in Salima) of the homes of friends and relatives. Upon follow up, presence of soap increased to 76% (n = 205, 120 in Blantrye, 85 in Salima). Friends and relatives were asked to demonstrate hand washing; at baseline only 18% (n = 48, 34 in Blantrye and 14 in Salima) completely lathered their hands with soap compared with follow-up measures of 60% (n = 160, 088 in Blantyre and 72 in Salima). The 42% increase was statistically significant (p< 0.0001). These results showed that the beneficial impact of antenatal hygiene kit program in regards to water treatment and hand washing behaviors extended well beyond expectant mothers to friends and relatives. Since social networks influence behavior, future hand washing campaigns should promote hand washing with soap as a social norm (Curtis, Danquah & Aunger, 2009).

Hand Washing in United States and Other Developed Countries

To a lesser extent, hand washing has been studied in developed countries. For example, Burton et al. (2011) conducted a randomized control trial in Britain to determine whether non-antibacterial soap was better at reducing bacteria of potential fecal origin than water only. A further purpose of the study was to clarify whether a simple and quick microbiological test could be applied to large groups to distinguish people who practiced hand washing from those who did not. This study consisted of 20 volunteers that were either taken to a large and frequently visited British museum, or asked to travel on a bus or the underground, and asked to deliberately

wipe their hands over handrails, door handles, and seats with the aim of contaminating their hands. Using a pre-determined random sequence, subjects were then asked to wash their hands with water and soap, with water only, or not to wash at all. Each volunteer repeated this sequence 24 times, eight times for each of the three hand washing approaches, for a total of 480 collected samples. Overall, hand washing with water alone substantially lowered the prevalence of bacteria. However, hand washing with soap was more effective in reducing prevalence of contamination and other species and was found to be superior to using water alone. Another finding of this study was that measuring hygiene behavior was difficult due to the over reporting and to changes in behavior when being observed.

There were few studies of hand washing in the US except those done mainly in acute care settings (hospitals/nursing facilities), food service (restaurants/cafeterias), and daycares (Larson & Duarte, 2001; Mackert, Liang, & Champlin, 2013). Studies that addressed the use of hand washing surrogates in the community were lacking (Mackert, Liang, & Champlin, 2013). In this review of literature, no articles were found that specifically targeted Hispanic/Latina women and hand washing in the United States at the community level. This review was conducted using articles dating five years previous, using multiple databases. Further research is clearly necessary needed to understand the beliefs, behaviors, knowledge, and practice of hand washing in this community, and more research is needed to understand the beliefs and behaviors that underlie the knowledge – practice divide related to hand washing. In other words, "Why do people who know the benefits of hand washing, still fail to practice it?"

Summary

Several studies showed a disconnect between hand washing knowledge and hand washing practice and behavior (Aiello, Coulborn, Perez and Larson, 2008; Briere et al., 2012;

Curtis, Danquah, and Aunger, 2009; Jumaa, 2005; Pengpid and Peltzer, 2012; Rabbi and Dey, 2013). Although people may understand the importance of hand washing, they still may not perform it. Further research is needed to understand the role of beliefs and behaviors that lie beneath this knowledge - practice divide. Current articles, from 2008 to present, pertaining to hand washing practices, knowledge and behaviors among Hispanic women in the United States household and community settings are limited; therefore, more studies are needed. Further research is necessary to understand the beliefs, behaviors, knowledge and practice of hand washing in this community and interventions are needed to enhance the continual practice of hand washing with soap.

CHAPTER 3: THEORY

Theoretical Framework

The Theory of Planned Behavior guided further work with this hand-washing project. The Theory of Planned Behavior is an intrapersonal behavioral theory with three domains: 1) attitude toward behavior; 2) subjective norm that incorporates social norms and 3) perceived behavioral control (Eiamsitrakoon et al., 2009). The attitude toward the behavior is deemed favorable or unfavorable based on the likely consequence of the behavior, known as the behavioral belief. Therefore, since hand washing decreases the spread of infection, a positive consequence, the attitude toward hand washing should be favorable and thus hand washing should increase with increased knowledge.

The subjective norm is the perceived social pressure in which the belief to perform the behavior is based on the expectations of others (Ajzen, 2010). Hand washing can be a social behavior. By participating in hand washing as others in one's social circle do, the motivation to perform hand washing is increased (Curtis et al., 2009).

The perceived behavioral control or control belief is manifested through the presence of factors that may facilitate or impede performance of the behavior (Ajzen, 2010). For example, when soap and water is present or readily available, hand washing is easily facilitated. When water is limited or no soap is available, hand-washing performance is impeded. Therefore, when all factors, soap and water, are present, then hand washing can be performed, allowing people control over their hand washing behavior.

The Theory of Planned Behavior also makes assumptions that humans are rational, that available information is utilized, and that consequences to their actions are considered. The Theory of Planned Behavior implies an intention to behave in a certain way (Ward, 2012). Given a sufficient degree of control over the behavior, one is expected to carry out an intention when the opportunity arises. Intention is then assumed to be the immediate precursor to behavior (Ajzen, 2010). As a general rule, the more favorable the attitude and the subjective norm, and the greater the perceived control over the behavior, the more robust should be the person's intention to perform the behavior (Ajzen, 2010). When hand washing is viewed as a social norm, hand washing can contribute to social acceptance; one is more likely to wash their hands with others present. The Theory of Planned Behavior was used to help design and evaluate this hand-washing project (Mackert, Liang, & Champlin, 2013).

CHAPTER 4: METHODOLOGY

IRB Approval

Through the University of North Carolina at Chapel Hill Institutional Review Board (IRB) approved this project for exempt status. This project was conducted in collaboration with a Federally Qualified Community Health Center (FQCHC) in eastern North Carolina (See Appendix 3).

Design

This project was a pre- and post-test design of hand washing practices with an evidence-based educational intervention on hand washing. The pre-test evaluation addressed present practices, knowledge, beliefs and attitudes regarding hand washing, germs and prevention of illness. The post-test evaluation assessed responses to the same questions four weeks ± seven days after the intervention per a telephone interview to determine if the intervention had an impact on knowledge or practices. The length of four weeks ± seven days was chosen to allow for a sufficient amount of time to lapse such that short-term memory would not be a factor for the participants to repeat the same answers. This time lapse also allowed for practice of new behavior and that behavior to become a habit. The evidence-based hand washing intervention utilized CDC (2014) guidelines. Participants were asked to wash their hands, as they normally would, unaware that they were being timed. The investigator performed a demonstration, with a return demonstration by the participants.

Subjects

Sixty Hispanic females, ≥ 18 years of age, were recruited through convenience sampling in the waiting room of a rural FQCHC. Participants were assigned a study number that correlated with their names for tracking purposes. The participants lived in rural areas from five NC counties (Wake, Johnston, Harnett, Sampson, and Duplin) and were active patients at a FQCHC in eastern North Carolina. Demographics were obtained on counties serving and surrounding the FQCHC (See Table 1: Population of Hispanic Women by Location).

Table 1. Population of Hispanic Women by Location

Location	% of Hispanic Population (2014)	% of Female Persons (2014)	No. of Hispanic Women	Total No. Hispanics (Adult)
North Carolina	9.0%	46.5%	372,385	800,120
Wake County	10.0%	51.3%	48,744	99,706
Johnston County	13.4%	50.9%	11,240	24,257
Harnett County	11.9%	50.5%	7,175	15,060
Sampson County	18.4%	50.8%	5,381	11,783
Duplin County	21.6%	50.8%	5,830	12,963

Note. Adapted from U.S. Census Bureau: State and County QuickFacts for each County listed, 2014. Adapted from Suburban Stats, Current Population Demographics and Statistics for NC by age, gender and Race, 2014.

As of the 2012 Census of Agriculture, North Carolina ranked sixth in the nation in the number of migrant farmworkers and annual horticulture crop sales (United States Department of Agriculture, 2016). There were more than 75,000 farmworkers in North Carolina within each

growing season; this did not include their dependents per the 2007 Census of Agriculture (United States Department of Agriculture, 2015).

Setting

The setting for the project was in a rural federally qualified community health center (FQCHC) in eastern North Carolina that offered services on a sliding scale fee. This site was selected because of the large percentage of Hispanic women who attended this clinic and who would benefit from this project.

Recruitment

Recruitment of participants and the administration of the questionnaire took place in the waiting room. Recruitment for this project took place during three different seasons of the year: winter, spring, and fall. Recruitment occurred in January, February, May and October of 2015. Some Hispanic families were seasonal farmworkers and therefore changed locations after certain harvests were finished. In the United States, there are just over one million hired farmworkers (United States Department of Agriculture, 2015).

Measurement and Variables

Demographic information.

Demographic information of the participants included home county, language spoken, age in years, pregnant or not, household size, number of children in the home under age 12, highest level of education obtained, and range of household income (see Appendix 4 and Appendix 5).

Survey/Questionnaire.

Hygiene habits, practices, attitudes, and beliefs about hand washing were determined using a modified version of the Home Hygiene Assessment (see Appendix 6 - English and

Appendix 7 - Spanish). The original Home Hygiene Assessment was used in the homes of Hispanic/Latino families in low-income housing in an urban setting. The Home Hygiene Assessment instrument, developed by Dr. Elaine Larson, was translated from English to Spanish, reviewed, back translated, and then tested. The original instrument was a 31-page interview booklet with five sections. Section I recorded demographics and recruitment information. Section II included 45 questions about home hygiene practices: food preparation and handling, laundry, general cleaning, and personal hygiene (hand washing and bathing). Section III contained 16 questions for each member of the family about demographics and illness information. Section IV recorded interviewers observation in the home, included were the brands of all cleaning and personal hygiene products present in the home and visual appearance of the kitchen, laundry, or storage areas, and the bathroom. Section V encompassed three questions to solicit their attitudes and beliefs regarding hygiene (Larson & Duarte, 2001). Content and face validity of the instrument were assessed and reviewed by experts in the fields of food and environmental microbiology, home hygiene, and infectious disease (Larson & Duarte, 2001). Elaine Larson and her team used this tool in the homes of the participants and then conducted follow-up with a phone interview. The investigators made an appointment to meet with the subjects and families in their home, asked them questions regarding different aspects of hygiene, observed hand washing, and observed areas within their residences for products and cleanliness. Approval to use the tool was obtained via email communication from Dr. Elaine Larson (See Appendix 8).

For the purpose of this project, a modified version of the survey was created. The survey included items related to hand washing practices (habits/behaviors), knowledge, attitudes, and beliefs. The modified version consisted of a five-page document including eight demographic

questions, five questions regarding hand-washing habits/behaviors with three of these questions encompassing knowledge, and three questions about attitudes and beliefs about germs and prevention of illness. Of the five questions regarding hand washing, three of the questions were used directly from the Home Hygiene Assessment. The three questions about attitudes and beliefs were used directly from the Home Hygiene Assessment. These questions were chosen from the Home Hygiene assessment due to relevance to this project. The modified version was translated from English to Spanish, reviewed, and then back translated (see Appendix 4, Appendix 5 and Appendix 6). This modified version of this survey was completed in the waiting room of a federally qualified community health center initially and follow-up performed via telephone interview, which differed from the original use of the questionnaire in the home of the participants. The questions regarding hand-washing practices, attitudes, and beliefs were asked in a public setting but maintained relevance by being specific to the participant.

Intervention

Product.

In this intervention, the branded product, Glo Germ, was used to simulate microbes left on the hand after hand washing demonstrations. Dean Luxton invented Glo Germ in 1968 and in 1975 DMA International acquired the rights to Glo Germ. Glo Germ has played a major role in the training of medical staff, patients, food handlers, daycare workers, and children throughout the globe (Glo Germ, 2015). Glo Germ is a germ simulator that, when applied, washed off, and then placed under an ultra-violet (UV) light reveals the remaining "germs" as proof of improper hand washing (Glo Germ, 2015). Glo Germ products are available in liquid and powder form that contains proven safe ingredients formulated to be the same size as bacteria, or approximately 5 microns in size. This project used the liquid form. When used in liquid form, with an ultra-

violet light, Glo Germ simulates the spread of germs, demonstrating how rapidly and broadly germs can spread in short time period.

Outline of Procedure.

After IRB approval for exemption (Appendix 3), the intervention took place in the waiting area of the FQCHC and involved:

1. Verbal consent was obtained to participate in this project (n=60).
2. Completion of a questionnaire including the enrollment form, demographic data, and information obtained from the modified Home Hygiene Assessment instrument on the participant's practices, habits, knowledge, attitude, and beliefs (Appendix 4, Appendix 5, Appendix 6 and Appendix 7).
3. Initial hand washing demonstration that took place in a private restroom off the waiting area that had access to running water and soap (n=60). Participants were told a germ simulator (Glo Germ) would be used and were asked to apply Glo Germ and then wash their hands as they normally would at home.
4. A stopwatch was used to time how long the participant washed their hands. Time started once participant wet their hands with running water from the sink. Participants were unaware of being timed. The stopwatch was worn on the investigator's wrist but was not concealed.
5. Effectiveness of participant's hand washing using Glo Germ and a handheld black light was assessed which showed areas missed while hand washing.
6. The student investigator provided an educational session regarding the CDC's recommendations for hand washing, including a demonstration. The education intervention was based on the CDC guidelines for when and how to wash hands with soap and running water (CDC, 2014) (See Appendix 1).

7. Thirty-nine participants were asked to wash their hands once more, again unaware that a stopwatch was used to time the second (2^{nd}) hand washing. Glo Germ was reapplied, hand washing re-demonstrated and black light used again. This was only performed with the participants recruited in May and October, 2015 (n=39) due to modifications to the project after recruitment in January and February, 2015.

8. Review of CDC's guidelines was performed using a laminated hand out for all the participants (n=60). They were given this handout and a bar of soap to take home (see Appendix 1 and Appendix 2).

9. The student investigator then asked if there were further questions and comments, which were recorded.

10. The same questionnaire (the modified Home Hygiene Assessment) on the participant's practices, habits, knowledge, attitude, and beliefs was administered over the phone (33 of the 60 participants) by a Hispanic Spanish speaking female four weeks ± seven days after the intervention.

Procedure

Upon check-in to the clinic, adult female Hispanic patients were asked if they wanted to learn more about a hand-washing project. The project was explained to the potential participants, and they were asked if they would like to participate in the project. Sixty patients verbally agreed, and were offered either the Spanish/English version of the questionnaire with explanation. The student investigator (the doctor nursing of practice (DNP) student who is a family nurse practitioner and fluent in English and Spanish), and/or a Hispanic Spanish speaking female community liaison, interviewed the participant using the questionnaire, and recorded participants' responses accordingly. Once the questionnaire was completed, the student

investigator reviewed the questionnaire for completeness. Then the participant was asked to apply Glo Germ to their hands and given the explanation that this would simulate germs on their hands. They were asked to go into the bathroom adjoining the waiting area to wash their hands, as they would normally do at home. The length of time that the participant washed her hands was timed using a stopwatch and then recorded. After washing their hands, a black light was used to show areas that still contained Glo Germ and was noted. The investigator then demonstrated proper hand washing technique using CDC guidelines (2014), Glo Germ, and the black light.

Out of the 60 participants, 39 during the second recruitment phase (May - October, 2015) were asked to repeat the demonstration by reapplying Glo Germ and washing their hands using the technique shown. The 2nd hand washing was timed using a stopwatch. The black light was used again to see if participants had any areas that contained Glo Germ and if there was improvement from the first hand washing.

All 60 participants were allowed to ask questions at any time during the intervention. Questions asked by participants during the intervention were answered and tracked. At the completion of the intervention, participants received a bar of soap, travel size package of tissue, and a laminated two-sided copy of CDC guidelines in English (see Appendix 1) with the reverse being a Spanish equivalent (see Appendix 2). A Hispanic Spanish-speaking female administered a follow-up questionnaire over the phone in four weeks ± seven days, after the intervention.

Chapter 5: RESULTS AND DISCUSSION

Data Analysis

Data were entered in to Microsoft Excel. After consulting with a statistician, word answers such as yes or no, were coded as 0 = no and 1 = yes. All questions that followed numeric progression were numbered starting with 1 and advanced accordingly. For answers to three questions that allowed for free text, word answers were categorized by themes. Hand washing activities question had eight categories identified as: before or after eating, after handling pets or objects, before feeding a baby, after going to the bathroom, cooking/handling food/in the kitchen, sick, after changing a diaper, or being outside. The question regarding why these products were used had seven categories classified as: the ability to clean hands, cause less sickness, they had children or a baby, used to clean especially the house, were safe or better or liked or used to them, hygienic, or good at disinfecting and to kill bacteria. The prevention of illness question had ten categories, which were identified as: wash hands, clean, disinfect, stay home, wash clothes often, brush teeth, use hand sanitizer, bathe/shower/personal hygiene, clean refrigerator, or related to children.

All data analysis was performed using Microsoft Excel. Descriptive statistics were used for demographic data and characteristics of the sample. Correlations, standard deviations, and multiple linear regressions were used to determine any relationships among demographic measures, number of self-reported times of hand washes (pre- and post-test), 1st timed hand washing, and the 2nd timed hand washing.

Demographic Findings

A total of 60 Hispanic women were recruited and enrolled in this project from January 2015 through October 2015 (see Figure 1: Participant Numbers Recruited by Dates). The majority of the subjects 58.3% (*n*=35) were recruited in October 2015 with the assistance of a female Spanish-speaking community liaison.

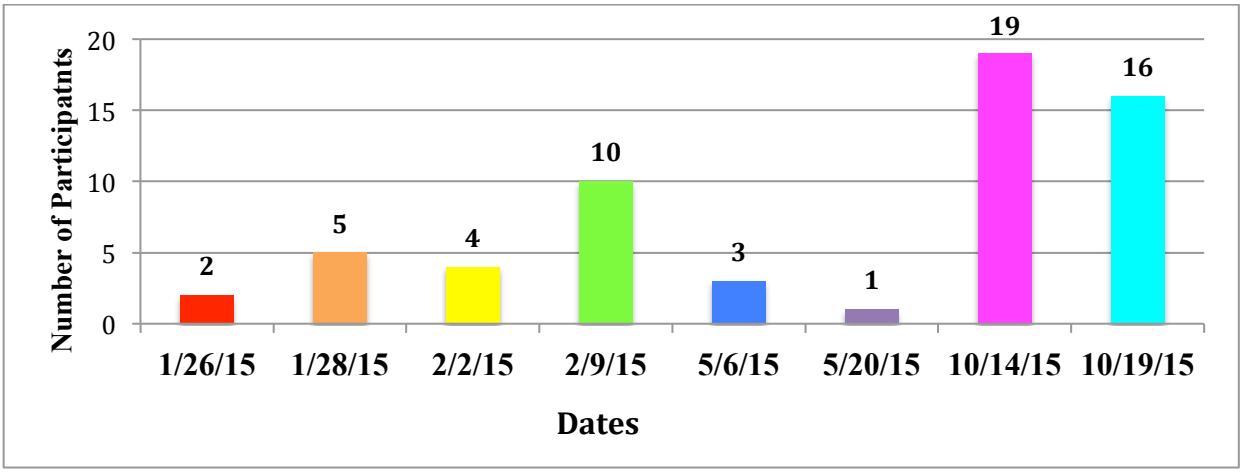

Figure 1: Participant Numbers Recruited by Dates

Women included in this project lived in five counties surrounding the rural federally qualified community health center (FQCHC) in eastern North Carolina. Sixty percent (60%) of the women were from Johnston County, 3% from Sampson County, 7% from Harnett County, 18% from Wake County and 2% from Duplin County (See Figure 2: Home County of Participants).

All of the women spoke Spanish, and 62% (*n*=37) of the women declared Spanish as the only language spoken. Thirty-eight percent (*n*=23) of the women reported being bilingual in English and Spanish. The Spanish version of the questionnaire was used for 65% (*n*=39) of the participants and the other 35% (*n*=21) used the English version.

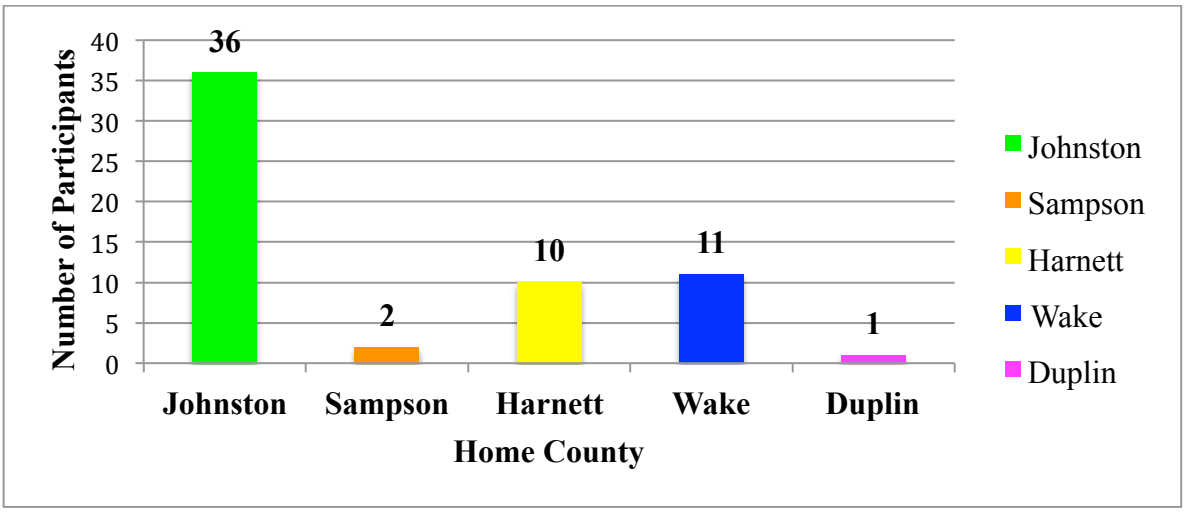

Figure 2: Home County of Participants

The average age of participants was 33.3 years, with the youngest being 18 years old and the oldest being 79 years old (*SD*=11.09). Median age was 33 years. Ages were distributed unevenly with the majority of the participants being less than 40 years old and in the 20-34 year old category (*n*=19) (See Figure 3: Age of Participants by Year Groups).

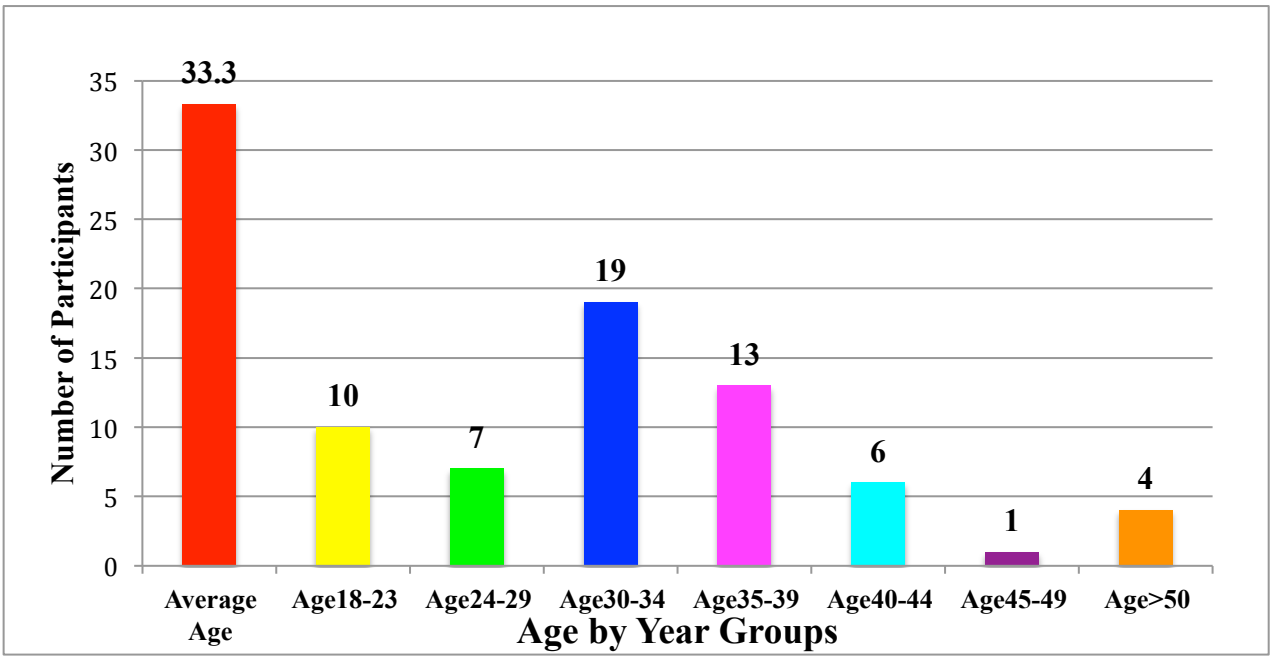

Figure 3: Age of Participants by Year Groups

Twenty percent (20%) of the women were pregnant (*n*=12). Household size ranged from 1 person in the home to 8 people in the home. The average household size was 4.53 people (*SD*=7.32).

The number of children in the household ranged from no children to 5 children, with average being 1.92 children (*SD*=7.54). Median and mode was equal to 2 children (*n*=21) (See Figure 4: Number of Children in Household Under Age 12).

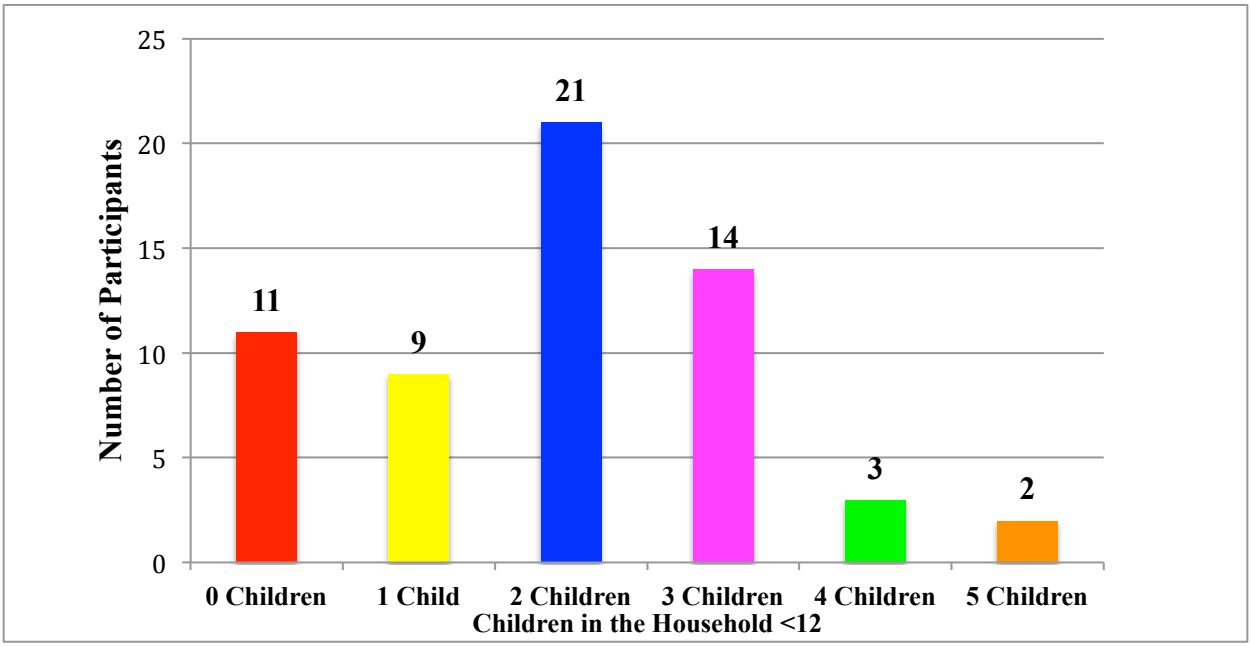

Figure 4: Number of Children in Household Under Age 12

All participants had a household income of less than $20,000 per year. The highest percentage (65%) (*n*=39) of the women reported annual household income of < $10,000. An average household income of $10,001 to $20,000 was reported among 11.7% (*n*=7) of the women. No woman reported income of >$20,000. There were 14 (23.3%) women who did not know their annual household income. Therefore, statistical imputation was performed by regression analysis to determine an accurate prediction of their income. Age and education level

were the variables used for the imputation regarding income. In this regression, intercept coefficient (β) = 1.07, age coefficient (β) = -0.03, education level coefficient (β) = 0.064, with R^2 = 0.08, and p = 0.18.

The highest percentage (33.3%) of the women reported no more than an elementary education (grades 1-5). Additionally 23.3% of the women reported having a middle school education (grades 6-8), 26.7% reported a high school education (grades 9-12), and 16.7% indicated having education beyond high school (See Figure 5: Highest Level of Education).

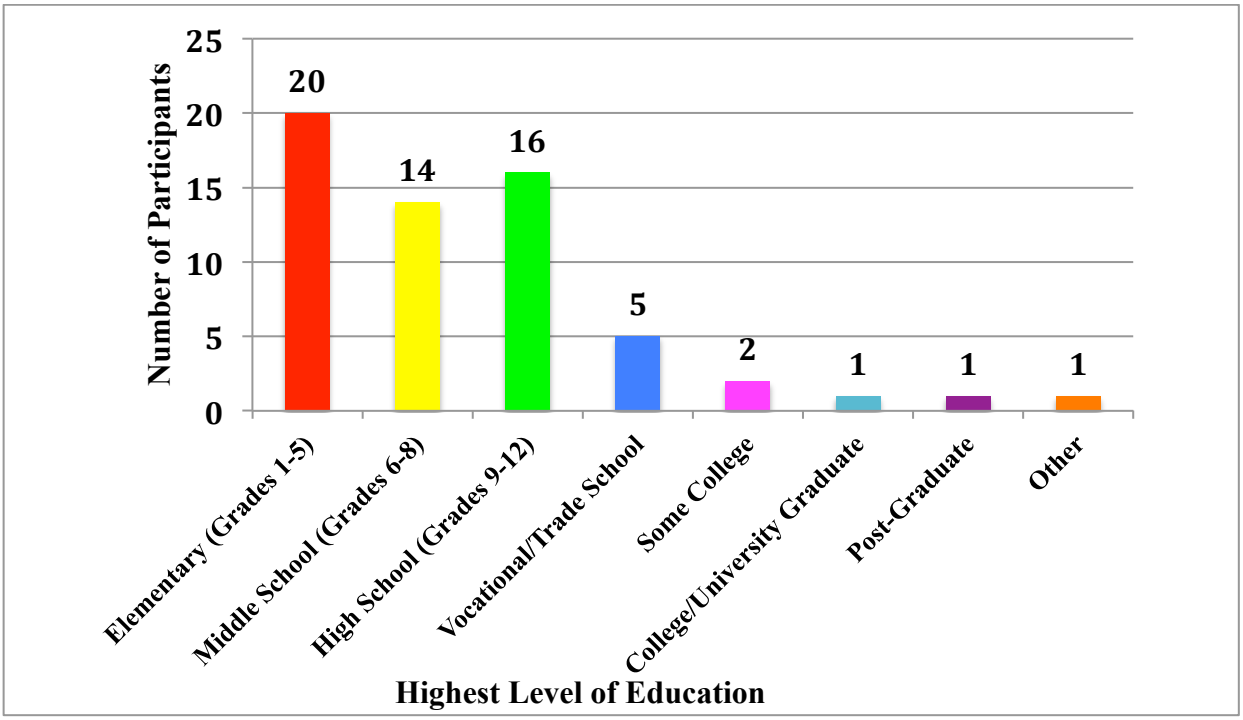

Figure 5: Highest Level of Education

All participants had been in the US for at least 3 years. With the majority (93%) having been in the United States for greater than 5 years (n=56) (See Figure 6: Time in the United States).

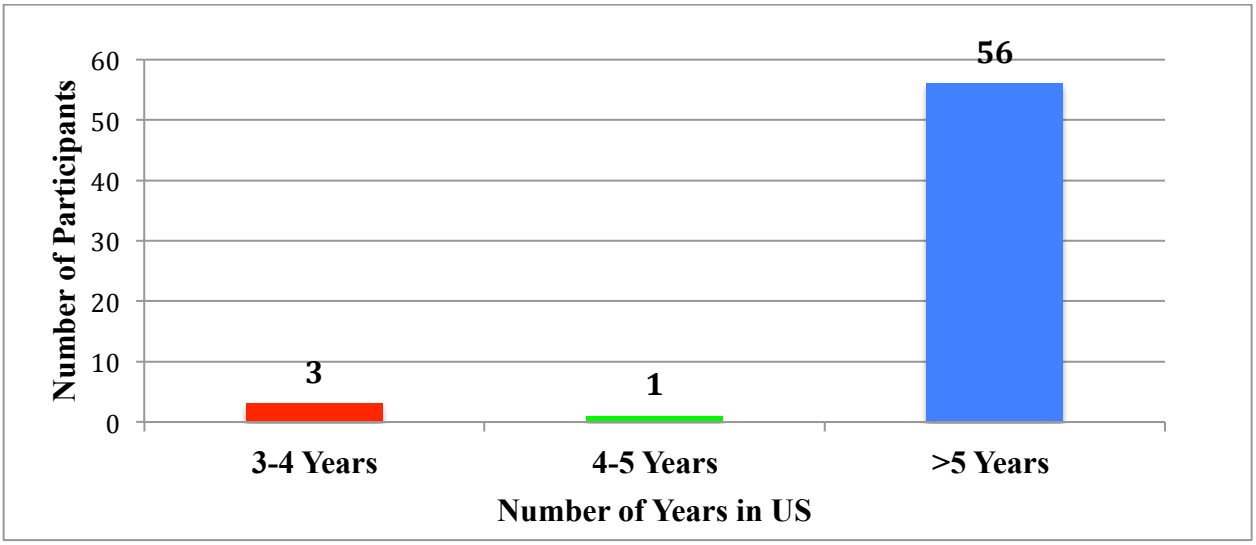

Figure 6: Time in the United States

Data on Hand Washing

Table 2: Project Activity including Participants (*n*)

Project Activity	**Participants Completing the Activity (*n*)**
Initial hand washing questionnaire	60
First (1st) timed hand washing	60
Received education intervention	60
Second (2nd) timed hand washing	39
Follow-up questionnaire	33

As indicated, 60 participants completed the initial questionnaire, demonstrated their hand washing technique and received hand-washing education. Due to a change in study protocol, only 39 participated in the second (2nd) hand washing after the intervention. Four weeks ± seven days after the intervention, the same questionnaire was administered over the phone by a Hispanic Spanish speaking female to 33 of the 60 participants to determine if the intervention resulted in a change in hand washing practices; overall, 27 were lost in follow-up.

Practices and Knowledge.

The average number of self-reported hand washes per day for the initial group (*n*= 60) was 12.68 times per day (*SD*=9.09). This average number of self-reported hand washes per day for the participants that completed the project (*n*=33) was 12.67 (*SD*=6.48) times per day for the initial session and 14.58 times per day (*SD*=8.22) for the second session.

The activities identified by the participants in which one always washed their hands and then categorized were before or after eating, after handling pets or objects, before feeding a baby, after going to the bathroom, cooking/handling food/in the kitchen, sick, after changing a diaper, or being outside. The top three activities for which participants reported that they washed their hands in the initial group (*n*=60) were (1) after going to the bathroom (*n*=53), (2) when cooking/handling food/working in kitchen (*n*=46), and (3) before eating (*n*=10). The activity rankings were the exact same for the follow-up group (*n*=33).

All participants reported using soap, whether specified as anti-bacterial or not. Additionally, the use of hand sanitizer was reported by 30% (*n*=18) of the participants and cleaning wipes/cloths were reported by 15% (*n*=9). This was consistent in follow-up with all participants (*n*=33) using soap, either regular or antibacterial, 30% (*n*=10) using hand sanitizer and slight increase was seen with 18% (*n*=6) using cleaning wipes/cloths.

The participants identified use of these products because of the ability to clean hands, cause less sickness, they had children or a baby, used to clean especially the house, were safe or better or liked or used to them, hygienic, or good at disinfecting and to kill bacteria. The initial 60 participants identified the top three reasons for utilizing these products were (1) for cleaning (*n*=17), (2) to clean hands (*n*=12), and (3) for disinfecting (*n*=9) for the initial group (*n*=60). These top three reasons were the same for the 33 participants in the follow-up group.

Participants, in accordance with CDC guidelines (2014), wet their hands, then lathered with soap, and washed their hands using running water. Hand washing was performed with soap and running water and timed initially for all participants (n=60), and average time of hand washing was 19.68 seconds (SD=8.62). Thirty-nine (39) completed a second (2^{nd}) timed hand washing after the CDC demonstration. The 2^{nd} timed hand washing (n=39) increased from initial 19.46 seconds to 29.95 seconds (SD=9.70). Therefore, a difference of 10.49 seconds was seen in the 2^{nd} timed hand washing.

Areas in which the participants left Glo Germ were around their nails (n=32), palms of hands (n=10), between fingers (n=5), wrists (n=3), and backs of hand (n=2). No exact measurements of those areas were performed, but notations were made regarding missed areas of the hands, with the most common areas still showing Glo Germ.

All the participants completing the questionnaire, both in the initial (n=60) and follow-up (n=33) groups, believed that germs could be picked up both away from home and at home. Places most likely to get germs were seen as bathrooms, other people, soiled laundry, toys, and kitchen, ranked in that order for the initial group. The follow-up group answered bathrooms, kitchen, soiled laundry, people, and toys in that order.

Activities identified for the prevention of illness were wash hands, clean, disinfect, stay home, wash clothes often, brush teeth, use hand sanitizer, bathe/shower/personal hygiene, clean refrigerator, or related to children. The top three (3) activities that were done to prevent infection were (1) clean (n=56), (2) disinfect (n=30) and (3) wash hands (n=26) for the initial group (n=60). Activity rankings were the exact same for the follow-up group (n=33).

Correlations.

Linear correlations were performed between each demographic measure and number of

self-reported times of hand washes, 1st timed hand washing, and the 2nd timed hand washing. The strongest linear relationship is indicated by a correlation coefficient of 1 or -1. Positive correlations are considered those with a positive number, with a strong correlation being closest to 1. The only measure that had a marginally significant finding was reported household income level in relation to 2nd timed hand washing (p = .08). This was interpreted as the income level increased for these women (n=39), their hands were washed longer in terms of seconds. (See Table 3: Correlations Between Measures).

Table 3: Correlations Between Measures (r)

Measure	Reported X HW	Secs Timed HW	Secs 2nd Timd HW
Age	.21	-.11	-.0002
Pregnant	.13	.03	.06
No. People in House	.15	.07	.11
No. Children <12	.15	-.07	-.13
Education Level	.02	-.01	.08
Income Level	.05	.06	.28*
Time in US	-.07	.20	.07

Note: *p< .1, **p< .05, Reported x HW = self-reported number of hand washes per day
Secs Timed HW = seconds of timed hand washing (n=60)
Secs 2nd Timed HW = seconds of 2nd timed hand washing (n=39)

Multiple Linear Regression.

Multiple linear regressions were performed on demographic data with the following outcome/dependent variables being considered: • the number of self-reported times hands washed per day, • timed number of seconds of hand washing, • a 2nd timed number of seconds of hand washing, and • post-test number of self-reported times of hands washed per day. Multiple linear regressions were calculated using all 60 participants and then re-calculated using

only the participants that completed the second phone questionnaire (*n*=33). Multiple linear regression was calculated for the 39 participants that completed the 2nd timed hand washing.

Within the linear regression between demographics of all participants (*n*=60) and number of self-reported times hands were washed per day, significance was found regarding age (p = .05). This was interpreted as for every additional year of life, hands are washed 0.18 more times. Marginal significance was found regarding pregnancy (p = .07). No other demographic proved significant (see Table 4: Multiple Linear Regression for Number of Self-Reported Times of Hand Washes).

Table 4: Multiple Linear Regression for Number of Self-Reported Times of Hand Washes (*n*=60)

Variable	No. Xs Report HW	
	β	*SE B*
Age	0.18**	0.09
Pregnant	4.62*	2.50
# Ppl in the House	.64	.72
# Children < 12	.54	1.02
Education Level	.45	.62
Income Level	.50	2.89
Time in US	-1.27	2.11
R^2		.14
F		1.21

*$p < .1$, ** $p < .05$*

For the multiple linear regression of the participants (*n*=60) with number of timed seconds hand washed there was no significance found among the relationships between the

demographic characteristics (see Appendix 9, Table 5: Multiple Linear Regression of Number of Seconds for the Initial Timed Hand Washed).

A multiple linear regression of data from the participants (*n*=39) was performed for the number of seconds for the 2nd timed hand wash. Marginal significance was found with number of people in the household ($p = 0.06$), number of children less than 12 years old within the home ($p = .09$) and income ($p = .06$) (see Table 6: Multiple Linear Regression of Number of Seconds for the 2nd Timed Hand Wash).

Table 6: Multiple Linear Regression of Number of Seconds for the 2nd Timed Hand Wash (*n*=39)

Variable	No. Secs 2nd HW	
	β	*SE B*
Age	.02	.14
Pregnant	-.08	4,57
# Ppl in the House	2.37*	1.22
# Children < 12	-3.11*	1.8
Education Level	-.40	1.15
Income	12.01*	6.09
Time in US	-1.12	3.13
R^2		.20
F		1.08

*$p < .1$, ** $p < .05$

Multiple linear regressions were performed using only the participants that completed the entire project (that is the second phone questionnaire, *n*=33). The multiple linear regression of the number of seconds hands washed found no significance among the demographics (see

Appendix 9, Table 7: Multiple Linear Regression of Participants that Completed the Project for the Number of Seconds Hand Washed).

However, the multiple linear regression performed for those that completed the project (*n*=33) revealed marginal significance for the initial number of self-reported times of hand washes per day for age ($p = .09$) and was statistically significant for pregnancy ($p = .007$). Therefore, being pregnant was correlated with the number of times hands were washed (based on self-report) (see Table 8: Multiple Linear Regression of Participants that Completed the Project for Number of Self-Reported Times of Hand Washes Initial Answer).

Table 8: Multiple Linear Regression of Participants that Completed the Project for Number of Self-Reported Times of Hand Washes Initial Answer (*n*=33)

Variable	No. Xs HW Initial	
	β	*SE B*
Age	.27*	.15
Pregnant	10.11***	3.50
# Ppl in the House	.61	.91
# Children < 12	1.48	1.44
Education Level	.02	.73
Income	-.33	.98
Time in US	.96	6.35
R^2		.33
F		1.72

*$p < .1$, ** $p < .05$, ***$p < .01$

The multiple linear regression performed for the follow-up number of self-reported times of hand washes per day was found to be statistically significant with pregnancy ($p = .01$) (see Appendix 9, Table 9: Multiple Linear Regression of Participants that Completed the Project for

Number of Self-Reported Times of Hand Washes Follow-Up Answer). This finding was not as robust as seen in the initial number of self-reported hand washes per day.

Discussion

The recruitment times for this project immediately followed the 2014 outbreak of Ebola in West Africa, happened during the annual 2014-15 flu epidemic, and coincided with the 2015 measles outbreak in California. Therefore, increased awareness was presented around hand hygiene especially hand washing, disease transmission, and disease prevention by health officials and the media.

The 60 women that participated in this project were a small convenience sample of the female Hispanic population that attended a FQCHC in eastern NC. Location of home county and age were distributed unevenly across location and lifespan. These Hispanic women and their families were considered to be below the poverty level with an average household size of 4.53 people and less than $20,000 household income. Federal Poverty Guidelines state that for a family of 5, the annual household income should be greater than $28,440 annually (MLRI, 2016). As well as a low socioeconomic status, education was low with the majority (56.6%) reporting no more than a middle school education. Federally Qualified Community Health Centers serve low-income patients providing a sliding scale fee for services. Therefore, this convenience sample could reflect the demographics of those who attend this FQCHC.

Frequency of self-reported hand washes per day was 12.68 times for the entire group (n=60), and 12.67 times for the group that completed the project (n=33). An increase occurred in frequency of self-reported hand washes to 14.58 times per day in the follow-up group (n=33). This increase may have been seen as an increase in practice based on the effects of this project,

over-reporting, observation, or motivation on the part of the participants that completed the project.

Findings in this project were consistent with the critical times for hand washing, per the CDC (2014) along with findings by Rabbi and Dey (2013), to prevent the transmission of infections: during all stages of preparing/handling food; before and after contact with body fluids/wounds or sick individuals; using the toilet, changing diapers, or helping child with toileting; after coughing, sneezing or blowing your nose; after touching animals, their food or waste; after handling garbage. One of the women indicated that she had a dog and did not realize that she needed to wash her hands after each time of petting him. Although not asked, some of the participants volunteered that they were in the health care and/or food service industry and had gone through similar training.

All the participants acknowledged use of some form of soap, whether regular or anti-bacterial. Average seconds of hand washing was 19.68 for the initial hand washing (n=60), which was consistent with the CDC guidelines (CDC, 2014). The 2nd timed hand washing increased from initial 19.46 seconds (n=39) to 29.95 seconds; a difference of 10.49 seconds difference in hand washing time.

When times were compared with only the participants that completed the phone questionnaire, the average time was 21.38 seconds (n=33, SD=7.8) for the initial hand wash and the follow-up hand wash after intervention average time 32.08 seconds (n=24, SD=9.85), with difference seen in this group of 10.7 seconds. Although the participants were not aware of being timed, the findings for this project regarding were similar to that of Ray, Zaman and Lasker (2010) in which significant improvement was seen in hand washing with soap after use of the stopwatch and review of the steps to hand washing. Therefore, the difference in times

demonstrated that the education intervention may be effective at increasing duration of the return demonstration: this was not a significant finding.

All participants believed that germs could be picked up anywhere, inside or outside of the home. An interesting finding was that initially the kitchen was considered the least likely area to get germs. With the follow-up group, kitchen was equal to soiled laundry with a tie for second position in rank. Since actions to preventing infection identified by these participants were cleaning and hand washing, the Theory of Planned Behavior was used to predict a difference in hand washing behavior and beliefs. Since hand washing is a social behavior that was controlled by the individual and the action performed was based on cues, (such as the presence of soap and water), the intent to hand wash would be performed when given the opportunity.

Linear correlations were performed between measures, to distinguish if any demographic measures were more strongly correlated than any others. There were no strong linear relationships between demographic measurements. Therefore, multiple linear regressions were completed. Within the linear regression between demographics of all participants (n=60) and outcome variable of number of self-reported times hands were washed per day, significance was found regarding age (p = .05). Hence, increased age was associated with an increase in number of self-reported hand washes. Statistical significance (p < .05) was found when multiple linear regressions were performed using only those participants that completed the entire project (n=33) across the outcome variable of number of self-reported times of hand washes per day pre- and post-intervention with relationship to pregnancy. Therefore, being pregnant was associated with an increased number of self-reported hand washes. An increase in hand washing could assist in the prevention of spreading infection, especially within the context of maternal-infant care.

Project Limitations

This project was not generalizable to the entire Hispanic population due to the small number of participants. This project was only a convenience sample of sixty participants within a FQCHC that offered sliding scale fee for services based on income. Several factors may have limited recruitment of participants including being performed in the waiting area causing the participant or family members increased anxiety that they would be called back for their appointment and they would be missed. Initially, a Caucasian female asked the potential participants to participate in this project rather than someone of Hispanic origin. After the Hispanic community liaison was used, recruitment was completed in just a matter of days. Although immigration status was not obtained, it was possible that some women did not trust that this project was not concerned with their status.

The modified questionnaire created and used in this study could have been a limitation. The questionnaire has not been used previously or validated in its current form. In addition to the questionnaire, the question regarding what products are used to wash hands could be an additional limitation. This question could have been misleading, in that the participant had to choose an answer and may have chosen one they felt was most correct, instead of accurate. Also this question did not include answer choices of none or other.

As with any project that was executed after its inception, limitations were present for this project. The limitations included the change in procedure from only timing one hand wash to timing a 2nd hand wash after the educational intervention. Therefore, the data regarding the 2nd hand washing must be framed in context that all participants were not included in the 2nd hand washing.

Follow-up was another limitation of this project. There were 10 participants of the 60 that refused further contact after the initial enrollment. Hence, only 50 participants were available for follow-up. Follow-up data was only collected for 33 of the participants. After being contacted on several different days and times of the day.

Since this project took place in a public setting, observation could alter results. The Hawthorne effect could have played a role in the outcomes of this project. The Hawthorne effect is defined as a change in behavior due to a subjects' awareness of being observed (Chen, Vander Weg, Hoffman & Reisinger, 2015). As with the findings of Burton et. al (2011), where hygiene behavior measurement was difficult to assess due to the over-reporting of desired practices and when being observed. This over-reporting of behavior and observation factored into the outcomes of study performed by Halder et. al (2010) in caregivers who were observed washing hands with soap approximately 33% of the time compared to their reported behavior of 47% and demonstrated behavior of 51%. Over reporting may have occurred with older women and the pregnant women. Older women may have known they needed to answer with a higher number, and the pregnant women may have known they should wash their hands more often. Due to the participants being observed and potential over reporting, the findings regarding amount of time hand washing and the number of times self reported may lack accuracy.

Use of the stopwatch could have been a limitation, although the participants were not aware of being timed. The findings for this project regarding the amount of time spent hand washing, lathering well with soap, and using warm water could have been elevated due to a stopwatch being used to time hand washing which was similar to findings by Ray, Zaman and Lasker (2010).

Another limitation to this project could be that most of participants were in the US for greater than 5 years and were thereby being acculturated to American ways. This was seen with those participants who voluntarily reported training for occupations in healthcare and foodservice.

Significance and Implication

This project demonstrated that these Hispanic women possessed had a good working knowledge of hand washing at present. Despite being of low-income status and having minimal education, these participants' hand washing behavior was consistent with CDC guidelines for how to properly wash their hands.

The handout provided at the end of participation reinforced the specific times when hand washing needs to occur. Many of the women continued to read the handout while continuing to wait. The use of the Glo Germ and the black light in this project enlightened these participants to their specific areas of deficit in performing hand washing especially under and around fingernails and palms of hands.

This project provided a practice insight that education regarding proper and correct hand washing should be continued regardless of prior knowledge or skill. Reinforcing their knowledge and skill encourages the practice of hand washing to continue. Further research is needed to understand the knowledge - practice divide not just in the community setting but also in their home setting to decrease the spread of germs and educate families. Since a statistically significant relationship was found with the initial participants age and self-reported number of hand washes, older Hispanic women may be good community educators. Thereby using the older Hispanic women as a resource and a train the trainer methodology, more widespread hand-washing education could be continued within the community.

Additional work is needed within this health system and others with large Hispanic populations, to provide further education efforts in teaching correct hand washing at appropriate times to Hispanic women, especially those who are pregnant. Hand washing techniques and guidelines should be incorporated into prenatal classes when motivation may be higher. The findings of this project will be shared with the administration and clinical staff of the federally qualified community health center in an effort to continue promotion and education of hand washing practices among Hispanic women.

Stop Germs! Stay Healthy! Wash Your Hands

WHEN?

- Before, during, and after preparing food
- Before eating food
- Before and after caring for someone who is sick
- Before and after treating a cut or wound
- After using the toilet
- After changing diapers or cleaning up a child who has used the toilet
- After blowing your nose, coughing, or sneezing
- After touching an animal, animal feed, or animal waste
- After handling pet food or pet treats
- After touching garbage

Keeping hands clean is one of the most important things we can do to stop the spread of germs and stay healthy.

HOW?

- **Wet** your hands with clean, running water (warm or cold), turn off the tap, and apply soap.
- **Lather** your hands by rubbing them together with the soap. Be sure to lather the backs of your hands, between your fingers, and under your nails.
- **Scrub** your hands for at least 20 seconds. Need a timer? Hum the "Happy Birthday" song from beginning to end twice.
- **Rinse** hands well under clean, running water.
- **Dry** hands using a clean towel or air dry them.

For more details on handwashing, visit CDC's Handwashing Website at www.cdc.gov/handwashing

CDC

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CS245253A

APPENDIX 2: CDC GUIDELINES IN SPANISH AND HANDOUT TO PARTICIPANTS

Lavarse las manos

Para más información sobre el lavado de manos, llame al Massachusetts Department of Public Health, Division of Epidemiology and Immunization, al 617.983.6800, o vaya al sitio web del MDPH en www.mass.gov/handwashing

Cuándo

Lávese las manos

antes de

- tocar o servir alimentos
- comer o beber
- ponerse o quitarse los lentes de contacto
- curar una cortadura, raspadura, quemadura o ampolla
- darle atención a un enfermo

después de

- ir al baño
- ayudar a alguien a usar el servicio sanitario*
- cambiar pañales (y no olvide lavarle las manos al bebé también)
- toser, estornudar, sonarse la nariz o sonarle la nariz a un niño
- manipular alimentos crudos, especialmente carne, aves, pescado o huevos
- manipular la basura
- tocar un animal (especialmente un reptil) o limpiar los desechos de un animal
- darle atención a una persona enferma o lesionada
- usar transporte público

Cómo

Todos aprendimos a lavarnos las manos cuando éramos chicos, pero a veces cuando estamos ocupados o apurados, lo hacemos demasiado rápido o nos olvidamos de hacerlo. Creemos que tenemos las manos limpias, pero esto no es así si no las lavamos bien.

Sólo enjuagarse las manos no es lavarlas, es apenas mojarlas. Para que las manos queden limpias hay que usar jabón.

Use jabón corriente. No es necesario usar jabón antibacteriano. Estos jabones matan las bacterias, pero podrían contribuir al problema creciente de resistencia a los antibióticos.

Una pasada rápida, aunque sea con jabón, no limpia bien las manos, y los pocos segundos que ahorra pueden costarle días si se enferma.

Para que las manos queden bien limpias, tállese las palmas, entre los dedos, detrás de las manos y debajo de las uñas por al menos 20 segundos.

Después de enjuagarse, séquese las manos con una toalla de papel. Use esa misma toalla de papel para cerrar el grifo de agua y abrir la puerta del baño.

APPENDIX 3: IRB

From: **IRB** irb_no_reply@mailserv.unc.edu
Subject: IRB Notice
Date: December 1, 2014 at 1:05 PM
To: cyndlee@email.unc.edu
Cc: djbarksdale@unc.edu, lhmiller@email.unc.edu

To: Cynthia Lee
School of Nursing

From: Office of Human Research Ethics

Date: 12/01/2014
RE: Determination that Research or Research-Like Activity does not require IRB Approval
Study #: 14-2916

Study Title: Hand Washing Practices of Hispanic Women in a Community Health Setting

This submission was reviewed by the Office of Human Research Ethics, which has determined that this submission does not constitute human subjects research as defined under federal regulations [45 CFR 46.102 (d or f) and 21 CFR 56.102(c)(e)(l)] and does not require IRB approval.

Study Description:

Purpose:

The purpose of this project is to evaluate current hand washing practices of a group of Hispanic women. Evaluation will be of current knowledge, attitude and beliefs regarding hand washing. This project will assess their hand washing technique and teach proper hand washing technique.

Participants: Approximately 50 Hispanic females, greater than 18 years of age

Procedures (methods): Project will be explained to potential participant. If participant agrees, they will be asked to apply a germ simulator to their hands, then asked to wash their hands as they normally would at home. A black light will be used to see if there are any areas missed. This activity will be timed. Then the participant will be asked questions in regards to hand washing practices, attitudes toward hand washing and beliefs about hand washing. The investigator (myself) will apply germ simulator, demonstrate proper hand washing technique and use the black light for missed areas. Then the participate will be asked to reapply germ simulator and ask to wash hands using the proper technique shown. The black light will be used again to identify any change. Participants will be allowed to answer questions at any time during the process, responses will be written down. In approximately 4 week ± 7 days, the participant will be seen again at the clinic and asked same questions again to see if there has been any change in practices, attitudes or beliefs.

Please be aware that approval may still be required from other relevant authorities or "gatekeepers" (e.g., school principals, facility directors, custodians of records), even though IRB approval is not required.

If your study protocol changes in such a way that this determination will no longer apply, you should contact the above IRB before making the changes.

CC:
Debra Barksdale, School of Nursing
Lisa Miller , School of Nursing Deans OfficeIRB Informational Message - please do not use email REPLY to this address

APPENDIX 4: ENROLLMENT FORM
Hand Washing DNP Project

Study ID: _____

Date Recruited: _____

Recruitment Site: _____

Name: _____

Home County: Johnston _____ Harnett _____

Sampson _____ Wake _____

Is it ok to Contact you prior to next appointment? Yes _____ No _____

Contact Number: _____

APPENDIX 5: DEMOGRAPHICS QUESTIONNAIRE

Demographic Information

Study ID_____

1. Do you speak English? Yes _____ No _____

2. Age in number of years: _____

3. Are you Pregnant? Yes _____ No _____

4. Number of people that live in your house: _____

5. Number of children under the age of 12 in your house: _____

6. What is your highest level of education?

    Elementary (Grades 1-5) _____

    Middle School (Grades 6-8) _____

    High School (Grades 9-12) _____

    Vocational/Trade School _____

    Some College _____

    College or University Graduate _____

    Post-Graduate _____

    Other _____

7. What is your household income?

Less than $10,000 _____

$10,001 - $20,000 _____

More than $20,000_____

8. How long have you been in the United States?

Less than 1year _____ 1-2 years _____

3-4 years _____ 4-5 years _____

More than 5 years _____

APPENDIX 6: HAND WASHING QUESTIONNAIRE

Now I will ask some questions about habits and customs that have to do with your personal hygiene like hand washing.

Hand Washing:

1. How many times a day do you usually wash your hands?

   _____ Times per day

2. Tell me, what are two activities for which you always wash your hands?

   1.

   2.

3. What products do you use to wash your hands? (Check all that apply)

   □ Soap □ Hand Sanitizer

   □ Handi-wipes/Cleaning wipes □ Antibacterial Soap

4. Why do use these products? _____

_____

5. *Ask the informant to wash their hands just as they normally would and time the duration of the wash. Count from the time hands are in direct contact with water and soap.* Emphasize that you are interested in their usual practice, not an ideal.

   _____ Seconds

Attitudes and Beliefs:

1. Where do you think it is most likely that your family picks up germs?

    1. At Home
    2. Outside of the home
    3. Both (about the same)

2. How likely can you get germs from the following places?

    Please choose either 1 = likely or 2 = unlikely

    1. Kitchen _____
    2. Bathroom _____
    3. People _____
    4. Soiled Laundry _____
    5. Toys _____

3. Please name me the three most important things that you do to prevent an infection in your home? Let the informant tell you, and write it down in the same order. DO NOT GIVE EXAMPLES or SUGGESTIONS.

    1. _____
    2. _____
    3. _____

APPENDIX 7: SPANISH VERSION OF ENROLLMENT FORM AND QUESTIONNAIRES

Proyectó DNP de Lavarse las manos

Identificación de estudio: _____

Fecha reclutado: _____

Sitio de Reclutamiento: _____

Nombre: _____

Condado donde vive: Johnston _____ Harnett _____

Sampson _____ Wake _____

Esta bien que te contacten antes de la próxima cita? Sí ____ No ____

Número de contacto: _____

Apéndice 7 - Información demográfica

Información demográfica

Identificación de estudio _____

1. Usted habla Ingles? Sí ____ No ____
2. Cuántos años tiene: _____
3. Está embarazada? Sí ____ No ____
4. Cuanta gente vive en su casa? _____
5. Número de niños bajo la edad de 12 años en su casa?: _____
6. Cuál es su nivel más alto de educación?

   Escuela primaria (grados 1-5) _____

   Escuela medio (grados 6-8) _____

   Escuela secundaria (grados 9-12) _____

   Escuela profesional/ escuela de comercio _____

   Un poco de colegio _____

   Graduado de colegio o universidad _____

   Postgrado _____

   Otro _____

7. Cuál es su ingreso?

   Menos de $10,000 _____

   $10,000 – 20,000 _____

   Más de $ 20,000 _____

8. Cuanto tiempo tiene usted en los Estados Unidos?

   Menos de 1 año _____ 1-2 años _____ 3-4 años _____

   4-5 años _____ Más de 5 años _____

Apéndice 7 - Cuestionario de Lavarse las manos

Ahora voy a preguntar sobre los hábitos y costumbres que tiene que ver con su higiene personal, como lavarse las manos.

Lavarse las manos:

1. Cuantas veces al día se acostumbra lavarse las manos? _____ Veces por día
2. Dime, dos actividades en cuales usted siempre se lava las manos?
    1.
    2.
3. Cuales productos usted usa para lavarse las manos? (marque todos los que aplican)

    Jabón _____ Desinfectante de manos _____

    Toallitas handi/ toallitas de limpiar _____ Jabón anti-bacteria _____
4. Porque usa esos productos?

    _____

    _____
5. Pregúntele al informante que se lave sus manos normalmente y tome el tiempo de la duración de lavarse las manos. Cuenta desde el tiempo que las manos entren en contacto directo con el agua y jabón. Enfatiza en que usted está interesado en su práctica habitual, no en un ideal.

    _____ Segundos

Actitudes y Creencias:

1. En donde cree usted que su familia levante gérmenes?
    1. En las casa
    2. Afuera de la casa
    3. Los dos (casi lo mismo)

2. Cuál es la probabilidad que usted agarré germen en estos lugares?

    Escoja cualquier 1= posiblemente 2= no es posible

    1. Cocina _____
    2. Baño _____
    3. Gente _____
    4. Ropa sucia _____
    5. Juguetes _____

3. Por favor, nombre me las tres más importante cosas que usted ase para prevenir infección en su casa? Deja que la informante te diga, y escribe lo en la misma orden. NO LES DES EJEMPLOS OR SUGESTIONES.
    1. _____
    2. _____
    3. _____

APPENDIX 8: PERMISSION FOR USE OF TOOL

From: **Larson, Elaine L.** ell23@cumc.columbia.edu
Subject: RE: Home Hygiene Assessment Tool Request
Date: September 16, 2014 at 6:09 PM
To: Lee, Cynthia Dawn cyndlee@email.unc.edu

Sure

Elaine Larson, RN, PhD, FAAN, CIC
Anna C. Maxwell Professor of Nursing Research
Associate Dean for Nursing Research
School of Nursing
Professor of Epidemiology, Mailman School of Public Health
Editor, American Journal of Infection Control
Columbia University
617 W. 168th St, Room 330
New York, NY 10032
212-305-0723
Fax: 212-305-0722
Ell23@columbia.edu

-----Original Message-----
From: Lee, Cynthia Dawn [mailto:cyndlee@email.unc.edu]
Sent: Tuesday, September 16, 2014 6:07 PM
To: Larson, Elaine L.
Subject: Re: Home Hygiene Assessment Tool Request

Thanks so much.
Cynthia Lee

Serving From A Daily Measure of Grace

> On Sep 16, 2014, at 4:43 PM, "Larson, Elaine L." <ell23@cumc.columbia.edu> wrote:
>
> Attached, but they have not been used for years, so would certainly need testing.
>
> Elaine Larson, RN, PhD, FAAN, CIC
> Anna C. Maxwell Professor of Nursing Research Associate Dean for
> Nursing Research School of Nursing Professor of Epidemiology, Mailman
> School of Public Health Editor, American Journal of Infection Control
> Columbia University
> 617 W. 168th St, Room 330
> New York, NY 10032
> 212-305-0723
> Fax: 212-305-0722
> Ell23@columbia.edu
>
> From: Lee, Cynthia Dawn [mailto:cyndlee@email.unc.edu]
> Sent: Tuesday, September 16, 2014 4:38 PM
> To: ell23@columbia.edu
> Subject: Home Hygiene Assessment Tool Request
>
> Dr. Larson,
>
> My name is Cynthia Lee and I am a DNP student at the University of North Carolina at Chapel Hill.
> I am working on my doctoral project regarding hand washing and Hispanic women.
> I was wondering if you would be so kind as to share a copy of both the English and Spanish version of your Home Hygiene Assessment tool.
>
> Thank you for your consideration and time,
>
> Cynthia D Lee
>
> [cid:image001.png@01CFD1CD.60B0BCD0]
>
> <image001.png>
> <HH EN Quarterly Assessment.doc>
> <HH EN new member information form.doc> <HH Initial Assessment Quest
> EN.doc> <HH Initial Assessment Quest ES.doc>

APPENDIX 9: TABLES OF DATA FINDINGS

Table 5: Multiple Linear Regression of Number of Seconds for the Initial Timed Hand Washes (*n*=60)

Variable	No. Timed Sec HW	
	β	*SE B*
Age	-.07	0.09
Pregnant	.50	2.64
# Ppl in the House	.56	.77
# Children < 12	-.87	1.07
Education Level	-.23	.66
Income	.64	3.05
Time in US	2.86	2.23
R^2		.07
F		.59

**p < .1, ** p <.05*

Table 7: Multiple Linear Regression of Participants that Completed Project for the Number of Seconds Hand Washed (*n*=33)

Variable	F/U No. Secs HW	
	β	*SE B*
Age	-.12	.19
Pregnant	2.34	4.40
# Ppl in the House	-.50	1.14
# Children < 12	1.49	1.81
Education Level	.70	.92
Income	-1.15	1.23
Time in US	2.04	7.99
R^2		.09
F		.35

*$p < .1$, ** $p < .05$

Table 9: Multiple Linear Regression of Participants that Complete Project for Number of Self-Reported Times of Hand Washes Follow-Up Answer (*n*=33)

Variable	No. Xs HW Initial	
	β	*SE B*
Age	.27	.20
Pregnant	12.44***	4.53
# Ppl in the House	.97	1.18
# Children < 12	2.00	1.87
Education Level	.30	.94
Income	-.05	1.26
Time in US	-4.40	8.23
R^2		.30
F		1.50

**p < .1, ** p <.05, ***p < .01*

REFERENCES

Aiello, A. E., Coulborn, R. M., Perez, V., and Larson, E. (2008). Effect of Hand Hygiene on Infectious Disease Risk in the Community Setting: A Meta-Analysis. *American Journal of Public Health 98*(8), 1372-1381.

Ajzen, I. (2010). Constructing a Theory of Planned Behavior Questionnaire. New York: Psychology Press.

American Society for Microbiology (2010). *Don't Get Caught Dirty Handed.* Retrieved from http://www.microbeworld.org/washup

Bloomfield, S. F., Exner, M., Signorelli, C., Nath, K. J., & Scott, E., A. (2012). The chain of infection transmission in the home and everyday life settings, and the role of hygiene in reducing the risk of infection. IFH. Retrieved from http://www.ifh-homehygiene.org/review/chain-infection-transmission-home-and-everyday-life-settings-and-role-hygiene-reducing-risk

Bloomfield, S. F., & Scott, E. A. (2013). A risk assessment approach to use of antimicrobials in the home to prevent spread of infection. *American Journal of Infection Control, 41*(5 SUPPL.), S87-S93. doi:10.1016/j.ajic.2013.01.001

Briere, E. C., Ryman, T. K., Cartwright, E., Russo, E. T., Wannemuehler, K. A., Nygren, B. L., . . . Quick, R. (2012). Impact of integration of hygiene kit distribution with routine immunizations on infant vaccine coverage and water treatment and hand washing practices of Kenyan mothers. *Journal of Infectious Diseases, 205*(SUPPL. 1), S56-S64. doi: 10.1093/infdis/jir779

Burton, M., Cobb, E., Donachie, P., Judah, G., Curtis, V., & Schmidt, W. (2011). The effect of hand washing with water or soap on bacterial contamination of hands. *International Journal of Environmental Research and Public Health, 8*(1), 97-104. doi:10.3390/ijerph8010097

Cairncross, S., Hunt, C., Boisson, S., Bostoen, K., Curtis, V., CH Fung, I., & Schmidt., W. (2010). Water, sanitation and hygiene for the prevention of diarrhoea. *International Journal of Epidemiology,* 39, i193-i205. doi: 10.1093/ije/dyq035

Centers for Diseases Control and Prevention (CDC) (2014). *Stop Germs! Stay Healthy! Wash Your Hands.* Retrieved from http://www.cdc.gove/handwashinging

Centers for Disease Control and Prevention (CDC) (2011). *Hand washing: Clean Hands Saves Lives.* Retrieved from http://www.cdc.gov/handwashing/

Centers for Disease Control (2002). Morbidity Mortality Weekly Report (MMWR). Recommendations and Reports. Guidelines for Hand Hygiene in Health-Care setting. Retrieved from http://www.cdc.gov/mmwr/PDF/rr/rr5116.pdf

Chen, L., Vander Weg M., Hofmann, D., & Reisinger, H., (2015). *The Hawthorne Effect in Infection Prevention and Epidemiology.* Infection Control & Hospital Epidemiology, 36: 1444-1450 doi:10.1017/ice.2015.216

Curtis, V., Danquah, L., & Aunger, R. (2009). *Planned, motivated, and habitual hygiene behavior: an eleven country review.* Health Education Research. 2009, August; 24(4): 655-673. doi: 10.1093/her/cyp002

Curtis, V. A., Garbrah-Aidoo, N., & Scott, B. (2007). Ethics in public health research. Masters of marketing: bringing private sector skills to public health partnerships. *American Journal of Public Health, 97*(4), 634-641. doi: 10.2105/AJPH.2006.090589

Davison, J. (2015). Preventing and screening for communicable diseases. *The Clinical Advisor, 18*(5): 57-65.

Eiamsitrakoon, T., Apisarnthanarak, A., Nuallaong, W., Khawcharoenporn, T., & Mundy, L. M. (2013). Hand hygiene behavior: translating behavioral research into infection control practice. *Infection Control and Hospital Epidemiology, 34*(11), 1137-1145. doi: 10.1086/673446

Glo Germ (2015). *Glo Germ, Using Glo Germ.* Retrieved from http://www.glogerm.com/using.html

Glo Germ (2015). *Glo Germ, Company History.* Retrieved from http://www.glogerm.com/Company-History.html

Halder, A. K., Tronchet, C., Akhter, S., Bhuiya, A., Johnston, R., & Luby, S. P. (2010). Observed hand cleanliness and other measures of hand washing behavior in rural Bangladesh. *BMC Public Health, 10*. **DOI:** 10.1186/1471-2458-10-545

Heron, M. (2015). *Deaths: Leading Causes for 2011.* National Vital Statistics Report. U.S. Department of Health and Human Services. Centers for Disease Control and Prevention. National Center for Health Statistics. National Vital Statistics System. 2015, July 27; 64(7): 1-96. http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_07.pdf

Hoyert, D & Jiaquan, X. (2012). *Deaths: Preliminary Data for 2011.* National Vital Statistics Report. 2012, October 10; 16(6): 1-52. Retrieved from http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_06.pdf

Jumma, P., A. (2005). Hand hygiene: simple and complex. *International Journal of Infectious Disease.* 9, 3-14. doi: 10.1016/j.ijid.2004.05.005

Larson, E. L., Ferng, Y., Wong-McLoughlin, J., & Wang, S. (2009). Retention and Protocol Adherence of Hispanic Volunteers in a Longitudinal Trial. *American Journal of Health Behavior 33*(4), 435-444.

Larson, E., & Duart, C. G. (2001). Home Hygiene Practices and Infectious Disease Symptoms Among Household Members. *Public Health Nursing, 18* (2): 116-127.

Mackert, M., Liang, M., & Champlin, S. (2013). "Think the Sink:" Preliminary evaluation of a handwashing promotion campaign. *American Journal of Infection Control 41,* 275-277. doi: 10.1016/j.ajic.2012.03.023

MLRI (2016). *Federal Poverty Guidelines - 2016.* MassLegal Services. Retrieved from http://www.masslegalservices.org/content/federal-poverty-guidelines-2016

Oughton, M. T., Loo, V. G., Dendukuri, N., Fenn, S., & Libman, M. D. (2009). Hand hygiene with soap and water is superior to alcohol rub and antiseptic wipes for removal of clostridium difficile. *Infection Control and Hospital Epidemiology, 30*(10), 939-944. doi: 10.1086/605322

Pengpid, S., and Peltzer, K. (2012). Hygiene behavior and health attitudes in African countries. *Current Opinion Psychiatry 25* (2), 149-154. doi: 10.1097/YCO.0b013e32834fda33

Rabbi, S. E., & Dey, N. C. (2013). Exploring the gap between hand washing knowledge and practices in Bangladesh: A cross-sectional comparative study. *BMC Public Health, 13*, 89. doi: 10.1186/1471-2458-13-89

Ray, S. K., Zaman, F. A., & Laskar, N. B. (2010). Hand washing practices in two communities of two states of eastern India: An intervention study. *Indian Journal of Public Health, 54*(3), 126-130. doi: 10.4103/0019-557X.75734

Reddy, B. S., & Snehalatha, M. (2011). Sanitation and personal hygiene: What does it mean to poor and vulnerable women? *Indian Journal of Gender Studies, 18*(3), 381-404. **DOI:** 10.1177/097152151101800305

Russo, E., Manoj Menon, A., Wannemuehler, K., Weinger, M., Kudzala, A., Tauzie, B., Masuku, H., Msowoya, T., and Quick R. (2012). Water Treatment and Hand washing Behaviors among Non-Pregnant Friends and Relatives of Participants in an Antenatal Hygiene Promotion Program in Malawi. *The American Journal of Tropical Medicine and Hygiene, 86*(5), 860-865.

Sanitation and Hygiene Applied Research for Equity (SHARE) (2011). *Hand washing with Soap: Why it works and how to do it.* May 11, 2011. Retrieved from http://www.shareresearch.org/Resource/Details/guidelines_handwashingwithsoap

SteelFisher, G., Blendon, R., Kang, M., Ward, J., Kahn, E., Maddow, E., Lubell, K., Tucker, M., and Ben-Porath, E. (2015). Adoption of preventive behaviors in response to the 2009 H1N1 influenza pandemic: a multiethnic perspective. *Influenza and Other Respiratory Viruses 9*(3), 131-142. doi: 10.1111/irv.12306

Suburban Stats (2014). Current Population Demographics and Statistics for North Carolina by age, gender and Race. Population Demographics for North Carolina 2014 and 2015. Retrieved from https://suburbanstats.org/population/how-many-people-live-in-north-carolina

U.S. Census Bureau (2014). State and County QuickFacts . Last Revised: 10/14/2015 Retrieved from
Duplin County - http://quickfacts.census.gov/qfd/states/37/37061.html

Harnett County - http://quickfacts.census.gov/qfd/states/37/37085.html
Johnston County - http://quickfacts.census.gov/qfd/states/37/37101.html
Sampson County - http://quickfacts.census.gov/qfd/states/37/37163.html
Wake County - http://quickfacts.census.gov/qfd/states/37/37183.html

United States Department of Agriculture (2016). 2012 Census of Agriculture Highlights. U.S. Horticulture in 2014. Retrieved from http://www.agcensus.usda.gov/Publications/2012/Online_Resources/Highlights/Horticulture/Census_of_Horticulture_Highlights.pdf

United States Department of Agriculture (2015). Economic Research Service. Farm Labor. Retrieved from http://www.ers.usda.gov/topics/farm-economy/farm-labor/background.aspx

United States Department of Agriculture (2015). National Agricultural Statistics Service. 2007 Census of Agriculture. Farm Labor. Retrieved from http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/Fact_Sheets/Economics/farm_labor.pdf

United States Department of Agriculture (2013). Economic Research Service. Farm Labor. Hispanic Populations in Rural Areas. Retrieved from http://www.ers.usda.gov/topics/in-the-news/immigration-and-the-rural- workforce.aspx#Hispanic

Ward, D. (2012). The application of the theory of planned behavior to infection control research with nursing and midwifery students. *Journal of Clinical Nursing 22*, 296-298. doi: 10.1111/j.1365-2702.2012.04327.x

World Health Organization (2013). Healthy Environments for Children Alliance. Retrieved from http://www.who.int/heca/infomaterials/en/water_sanitation.pdf

World Health Organization (2005). Launch of the Global Patient Safety Challenge: Clean Care is Safer Care. Retrieved from http://www.who.int/patientsafety/events/05/global_challenge/en/index.html

World Health Organization (2015). *Health Topics, Hygiene.* Retrieved from http://www.who.int/topics/hygiene/en/

World Health Organization (WHO) (2015). *Media Centre, The top 10 causes of death*. Updated May 2014. Retrieved from http://who.int/mediacentre/factsheets/fs310/en/

World Health Organization (WHO) (2013). *Sanitation Challenge: Turning Commitment into Reality. Paying attention to gender and equity.* Retrieved from http://www.who.int/water_sanitation_health/hygiene/envsan/sanitchallenge/en/index7.htm