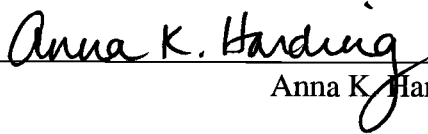


AN ABSTRACT OF THE THESIS OF

Aimee S. Pragle for the degree of Master of Science in Environmental Health Management presented on June 4, 2004.

Title: Handwashing Attitudes, Intentions, Behaviors and Barriers In The Restaurant Environment.

Abstract approved:



Anna K. Harding

The purpose of this study was to identify the knowledge, attitudes, practices and barriers related to handwashing in the restaurant environment. The study was designed with multidimensional study tools to include: a focus group conversation with questions to food workers to develop an initial understanding of knowledge, practice and attitudes relating to handwashing and surveys administered to food workers to provide a more quantitative assessment of the key issues addressed during the focus group. Theory of Planned Behavior variables were used to develop survey questions.

This study was developed as a joint project of the Environmental Health Specialists-Net (EHS-Net) through the Centers for Disease Control and Prevention (CDC), the Oregon Department of Human Services, and Oregon State University. Participants were randomly selected from two Oregon counties. A total of 18 food workers agreed to participate in the focus groups. A focus group was conducted in each county. Each focus group consisted of nine participants. A total of 31 food workers for a 10% response rate, agreed to complete surveys. Data were analyzed using the Statistical Package for Social Sciences (SPSS for Windows, 11.0).

Results indicated that focus group participants and survey respondents identified many similar factors that influenced handwashing practice. Although focus group participants knew correct handwashing practice and when to wash hands, they

identified several barriers that hindered correct handwashing in the restaurant environment. Food workers said both external and internal barriers factors effected handwashing practice. The external barriers emphasized most frequently by focus group participants included time pressure, lack of accountability, and lack of involvement and support from coworkers, managers. Survey participants also perceived lack of time as a significant barrier to handwashing and agreed that managers and coworkers had an influence on handwashing practice. Subjective norm (support from managers and coworkers) showed a significant correlation with intention. Protecting customers' health, personal health and being seen as a responsible food worker were identified as internal factors influencing handwashing practice.

© Copyright by Aimee S. Pragle
June 4, 2004.
All Rights Reserved

Handwashing Attitudes, Intentions, Behaviors and Barriers In The Restaurant
Environment.

by
Aimee S. Pragle

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Science

Presented June 4, 2004.
Commencement June 2005

Master of Science thesis of Aimee S. Pragle presented on June 4, 2004.

APPROVED:

Anna K. Harding
Major professor, representing Environmental Health Management

Marie Harvey
Chair of the Department of Public Health

Gelly Francis
Dean of Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Aimee S. Pragle
Aimee S. Pragle, Author

ACKNOWLEDGEMENTS

I would like to express sincere appreciation to the Oregon Department of Human Services, Oregon Environmental Health Specialists-Net, and the Centers for Disease Control and Prevention for helping support this study. I would like to give special recognition to my major professor, Dr. Anna Harding for her support, academic and professional guidance throughout my graduate program. Her kindness, encouragement and mentorship has been central to my learning experience.

I would also like to thank James Mack for your relentless effort in making this study possible. Being able to work with you has added immensely to my overall learning process.

The following people deserve my thanks for serving on my committee and for their advice: Dr. Anthony Veltri, my minor professor, and Dr. Carolyn Raab, my graduate representative.

Lastly, and most importantly, I would like to give special thanks to my husband, Eric, for his love, constant support and sunshine personality during the many hours I spent researching and writing. I am so proud of our amazing teamwork in completing graduate school together.

TABLE OF CONTENTS

	<u>Page</u>
1 INTRODUCTION.....	1
1.1 Purpose of the Study.....	4
1.2 Significance of the Study.....	4
1.3 Research Questions.....	5
1.4 Limitations of the Study.....	5
1.5 Definition of Terms.....	5
2 LITERATURE REVIEW.....	7
2.1 Association Between Handwashing and Foodborne Illness...	7
2.2 Food Workers' and Health Care Workers' Handwashing Practice.....	11
2.3 Factors Influencing Food Workers' Handwashing Practice...	12
2.4 Interventions to Improve Handwashing Practice.....	15
2.5 Description of the Theory of Planned Behavior.....	19
2.6 Focus Group Results and Survey Design.....	22
3 METHODOLOGY.....	23
3.1 Overall Strategy.....	23
3.2 Informed Consent Process.....	23
3.3 The Focus Group Technique.....	23

TABLE OF CONTENTS (CONTINUED)

	<u>Page</u>
3.4 Focus Group Methods.....	24
3.4.1 Setting.....	24
3.4.2 Sample.....	24
3.4.3 Recruitment.....	25
3.5 Design of Focus Group Questions.....	26
3.5.1 Opening Questions.....	26
3.5.2 Introductory Questions.....	27
3.5.3 Key Questions.....	27
3.5.4 Ending Questions.....	27
3.6 Focus Group Analysis.....	27
3.7 Survey Methods.....	28
3.7.1 Setting.....	28
3.7.2 Sample.....	28
3.7.3 Recruitment.....	29
3.8 Design of the Survey Instrument.....	30
3.9 Data Analysis.....	33
4 RESULTS.....	34
4.1 Focus Group Analysis.....	34
4.1.1 Research Question 1.....	34

TABLE OF CONTENTS (CONTINUED)

	<u>Page</u>
4.1.2 Research Question 2.....	37
4.1.3 Research Question 3.....	40
4.2 Survey Analysis.....	45
4.3 Characteristics of Survey Sample.....	45
4.4 Results of Each Theory of Planned Behavior Variables.....	45
4.4.1 Research Question 4.....	49
4.4.2 Research Question 5.....	56
5 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.....	58
5.1 Focus Group Discussion.....	58
5.2 Survey Discussion.....	62
5.3 Conclusions.....	68
5.4 Recommendations.....	70
6 BIBLIOGRAPHY.....	72

LIST OF FIGURES

<u>FIGURE</u>		<u>Page</u>
1	Theory of Planned Behavior.....	20
2	Correlation of Food Worker Survey Variables.....	68

LIST OF TABLES

<u>TABLE</u>		<u>Page</u>
1	Demographic Characteristics of Survey Sample.....	46
2	Educational Attainment of Survey Participants.....	47
3	Ownership and Type of Restaurant.....	48
4	Food Worker Survey Beliefs.....	50
5	Food Worker Survey Attitudes.....	51
6	Food Worker Survey Subjective Norms.....	52
7	Food Worker Survey Intentions.....	53
8	Food Worker Survey Perceived Control.....	54
9	Food Worker Survey Handwashing Behavior.....	55
10	Correlations Among Handwashing Variables.....	57

LIST OF APPENDICES

<u>APPENDIX</u>	<u>Page</u>
A Focus Group Informational Letter to Managers.....	82
B Focus Group Phone Script.....	83
C Focus Group Food Worker Contact Phone Script.....	86
D Participant Reminder Phone Call.....	90
E Focus Group Script.....	91
F Pre-Survey Letter.....	96
G Survey Phone Recruitment Script.....	97
H Survey Informational Letter to Managers.....	99
I Food Worker Survey Recruitment Letter.....	100
J Handwashing Survey.....	101

Handwashing Attitudes, Intentions, Behaviors and Barriers in the Restaurant Environment

INTRODUCTION

As the consumption and purchasing of meals from restaurants rises, proper and adequate hand hygiene at food preparation facilities is of increasing importance. Foodborne disease has both a public health and economic impact at the local, national and international level. Approximately 76 million illnesses, 323,000 hospitalizations, and 5,000 deaths in the United States each year are caused by foodborne diseases (Mead, Slutsker, Dietz, McCaig, Bresee, Shapiro, Griffin, & Tauxe, 2000). The Economic Research Services of the United States Department of Agriculture (USDA) estimates the cost of five foodborne pathogens *Campylobacter*; *Salmonella*; *E. coli* and *Listeria monocytogenes* alone costs \$6.9 billion a year in medical costs, productivity losses, and value of premature deaths by diseases (Marriot, 1999). Poor personal hygiene among food handlers and improper holding and storage temperatures are the two practices of retail establishments most commonly reported as contributing to foodborne illness (Lynch, Elledge, Griffith, & Boatright, 2003). These findings indicate that improvement of food workers' handwashing practice is crucial for the reduction of foodborne illness.

Handwashing is an essential practice in foodborne disease prevention. The Centers for Disease Control and Prevention has identified handwashing as the most important means of infection control in the health care industry (Boyce, & Pittet, 2002). Because hands are known to transmit disease, a number of studies have examined the handwashing practices and attitudes of health care workers towards handwashing in clinical settings. Extensive medical literature on the relationship between handwashing and nosocomial infections is available (Fendler, Dolan, & Williams, 1998). Although the tasks and duties of food service workers and health care workers differ, their situations are comparable. Both professions have challenging

work schedules, are physically demanding and involve the important task of handwashing to protect the public from infection and disease.

However, studies have found low levels of handwashing in food establishments. Food worker behaviors and preparation practices in food service establishments have been epidemiologically linked to repeated foodborne illness outbreaks (U.S. Department of Health and Human Services, 2001). Barriers contributing to the behavior of poor handwashing have been examined. Various studies have identified factors effecting food workers' handwashing practice in the restaurant environment. A study of a Norovirus outbreak identified food handling practices, food handler perceptions, and hotel kitchen policies as potential routes of foodborne illness transmission (Dippold, Lee, Selman, Monroe, & Henry, 2003). In a handwashing study by Howes (1996), lack of supervisory and/or peer support, and lack of provision of proper equipment; sinks, hot water, and soap were significant factors in preventing adequate handwashing.

In recent years, some of the larger outbreaks of restaurant food poisonings have been linked to inadequate or lack of handwashing. DeWall (1996) presented a synopsis of the following recent outbreaks. In June 1996, 38 people became ill from food contaminated with *Salmonella* served in a Wendy's restaurant in suburban Boston. Investigators determined the outbreak was caused by employees who did not wash their hands before handling food. An outbreak of 95 cases of Hepatitis A was traced to an employee of a Taco Bell restaurant in Salt Lake City in 1995. In June 1993, a Mexican restaurant in a Chicago suburb served *Salmonella*-tainted food that sent 25 people to the hospital and sickened 16 others. County investigators attributed the outbreak to prepared food not being held at hot enough temperatures, and to poor food handler hygiene. (DeWall, 1996). These outbreak descriptions demonstrate that several behaviors may contribute to foodborne outbreaks on the part of food workers, and that there is a need to identify barriers to handwashing in the restaurant environment.

Researchers have argued that the effectiveness of food worker training could be greatly improved if it was designed using health education and psychological theory (Ehiri et. al., 1997; Griffith, et. al., 1995; Rennie, 1995; WHO, 1998). The Theory of Planned Behavior (TPB) is a theoretical framework that has proven to be helpful in understanding and predicting handwashing behavior of health care workers (O'Boyle, 1998; Jenner, Watson, Miller, Jones & Scott, 2002). The TPB framework has also been utilized to examine food workers' beliefs and self-reported food safety practices (Clayton, Griffith, Price, & Peters, 2002), but this is the first study to implement the TPB in understanding food workers' handwashing practices.

The TPB consists of constructs believed to predict intention to perform behavior (Jenner, Watson, Miller, Jones & Scott, 2002). According to the TPB, a central factor in predicting behavior is an individual's intention to perform a behavior. Intention to perform a behavior is based upon the attitude towards the behavior, subjective norm and perceived control. The precursors to attitude, subjective norm and perceived behavioral control indirectly influence intention and the performance of the behavior. Attitude is determined by a person's view about the importance of an outcome, and the strength of his or her belief about the specific outcomes of a behavior (Ajzen, 1988). The Theory of Planned Behavior framework was applied in this study to identify barriers that contribute to inadequate handwashing in Oregon restaurants.

A statewide baseline study conducted by the Oregon Department of Human Services (DHS) from March 2002- March 2003 assessed 300 statewide facilities to collect data about cooking, holding, maintenance of equipment and personal hygiene. Upon completion of the study one of the major items of concern was inadequate handwashing. Researchers found that 49% of fast food restaurants and 63% of full service restaurants surveyed in Oregon did not practice proper and adequate handwashing (Oregon Department of Human Services, 2002).

Thus the current study was developed as a joint project of the Environmental Health Specialists-Net (EHS-Net) through the Centers for Disease Control and

Prevention (CDC), the Oregon Department of Human Services, and Oregon State University. The primary function of EHS-Net is to conduct studies which enhance the current body of knowledge regarding the environmental causes of foodborne illness. Developing interventions to promote proper and adequate handwashing practice in food establishments is a primary goal of this collaborative group. Understanding the knowledge, attitudes and practices of food workers' regarding handwashing is vital to the implementation of effective interventions.

Purpose of the Study

The purpose of this study was to identify the knowledge, attitudes, practices and barriers related to handwashing in the restaurant environment, in two Oregon counties. The study has been designed in two stages. The first stage involved focus group sessions with food workers who discussed their training, perception of barriers, and acceptability of current handwashing regulations. The second stage of the study included administering a written survey to food workers based on themes identified during the focus group sessions.

Significance of the Study

An increased understanding of food workers' handwashing practice in the restaurant environment is needed to improve the quality of handwashing practice in food establishments and reduce the occurrence of foodborne illness. It is hoped the results from this study will identify the barriers to handwashing within the restaurant environment. This research will provide qualitative and quantitative data to the Oregon Department of Human Services assessing the knowledge, attitudes and practices of food workers regarding handwashing practices in Oregon Restaurants.

Research Questions

The following research questions directed the study:

- 1) What is the general knowledge of handwashing practices of food workers in restaurant kitchens? (focus group)
- 2) What handwashing barriers exist for food workers in restaurant kitchens? (focus group)
- 3) What are positive influences for food workers that promote handwashing in restaurant kitchens? (focus group)
- 4) Using the Theory of Planned Behavior, what are food worker beliefs about outcomes, attitudes, subjective norms, intentions, perceived control, and self-reported behaviors regarding handwashing ? (survey)
- 5) What is the relationship between food worker beliefs about outcomes, attitudes, subjective norms, intentions, perceived control, and behaviors regarding handwashing? (survey)

Limitations of Study

Limitations to this study are as follows:

- 1) Study participants for both the focus groups and survey were limited to two Oregon counties.
- 2) Recruiting a sufficient sample size was difficult and contributed to the small number of focus group participants and small survey participant response.
- 3) Participants ranked the majority of survey items with great importance. This may have been due to bias inadvertently introduced to the design of the survey.
- 4) Due to time and funding constraints, only english speaking participants were recruited for the focus groups and surveys. This introduced bias in the study in that all possible groups of food workers were not represented in the study.

Definition of Terms

Campylobacter- A microaerophilic nonporeforming bacterium that causes foodborne illness.

E. coli- This facilitative anaerobic bacteria can be found in the intestines of warm-blooded animals, especially cows. The illness caused by Shiga toxin-producing E. Coli can be an infection or a toxin-mediated infection. Only a small amount of bacteria are required to produce an illness.

Focus Group- Unstructured interviews with small groups of people who communicate with each other and a group facilitator

Foodborne illness- An illness caused by the consumption of a contaminated food.

Handwashing- The proper cleaning of hands with soap and warm water to remove dirt, filth, and disease germs.

Listeria monocytogenes- A bacterium that can grow with or without oxygen that causes foodborne infection. This microbe is important to foodservice operations because it has the ability to survive under many conditions such as in high-salt foods and, unlike most other foodborne pathogens, can grow at refrigerated temperatures.

Salmonella- Facultative anaerobic bacteria frequently implicated as a foodborne infection. Salmonella is found in the intestinal tract of humans and warm-blooded animals. It frequently gets into food as a result of fecal contamination.

Theory of Planned Behavior- A conceptual framework used to measure three independent determinations of intention. These determinants are attitude toward behavior, subjective norm, and degree of perceived behavioral control.

LITERATURE REVIEW

The literature review is divided into the following topics: (1) association between handwashing and foodborne illness, (2) food workers' and health care workers' handwashing practices, (3) factors influencing food workers handwashing practices, (4) interventions to improve handwashing practices, and, (5) description of the theory of planned behavior

Association Between Handwashing and Foodborne Illness

For more than a century, handwashing has been recognized as an essential component in the prevention of the spread of microbial infection (Fendler, Dolan & Williams, 1998). The microbiological concepts explaining the science of handwashing practice during food preparation are simple to understand. Hand soaps/ detergents and the mechanical action of rubbing hands together loosen transient microorganisms on the surface of the skin, and the flowing water provides a way for the microorganisms to be removed. Drying hands with a paper towel completes the process by removing moisture conducive to bacterial growth (Snyder, 1998). The idea of cleansing hands with an antiseptic agent developed in the early 19th century when a French pharmacist noted that "solutions containing chlorides of lime and soda could eradicate foul odors" (Labarraque, 1829). In 1846, the development of handwashing to prevent infection continued when Ignaz Semmelweis insisted that students and physicians clean their hands with a chlorine solution between each patient to prevent the spread of infection (Boyce & Pittet, 2002).

Knowledge of the role of unclean hands in the spread of disease led to handwashing studies and procedures in the health care setting to reduce the transfer of microbial infection from one person to another (Snyder, 1998). In turn, the discovery that unwashed hands can transmit pathogens was applied to the development of hygienic practices to prevent microbial infection during food preparation. As the importance of food workers' handwashing practice became more understood,

researchers began developing studies to demonstrate the causative relationship between handwashing and foodborne illness. In 1965, Crisley and Foter declared that the primary reason for foodworkers to wash their hands was the removal of transient pathogenic microorganisms. A 1971 study (Pether & Gilbert) demonstrated that handwashing with soap and water, followed by drying with paper towels, reduced the risk of *Salmonella* residing on the skin. Handwashing effectiveness in preventing the transmission of microorganisms to food is now a well established principle in the food service industry (Paulson, 1996).

Foodborne illness of microbial origin has been identified as the most serious food safety problem (Collins, 1997). Surveillance data collected in the United States confirm that large foodborne disease outbreaks of Salmonellosis, Hepatitis A, Norovirus, and *E. coli* 0157 infection are on the rise (Kaferstein, Motarjemi, & Bettcher, 1997). Data on risk factors for foodborne diseases imply that most outbreaks result from faulty food handling practices. Clayton, Griffith, Price, & Peters (2002) suggest that improper food handler practices contributed to approximately 97 percent of foodborne illnesses in food-service establishments and homes. A review of over 260 outbreaks of foodborne illness from international journals shows that almost 40 percent of the outbreaks were caused by food workers who were either working with clear symptoms of infectious intestinal diseases or were asymptomatic (Michaels, 2000).

There are many ways food workers can transmit pathogens through poor handwashing practice. Cross-contamination may occur if a food worker handles contaminated raw meat, eggs or poultry and then touches a finished food product. Food items prepared with equipment such as knives or chopping boards that have been touched by unwashed hands can lead to contamination (Lane, 2001). Infected food workers can also transmit pathogens to others through bodily fluids from diarrhea, vomit, open skin sores, boils, fever, urine, or jaundice (Hunter, 2000). The purpose of handwashing is to break the chain of infection by either eliminating the causative agent or breaking the transmission pathway. Bryan, Chorine, & Larson (1995) pointed

out that infections transmitted by the fecal-oral route and in situations of poor personal hygiene were significantly reduced if proper handwashing practice was followed. Examining evidence for a casual link between handwashing and risk of infection, Larson (1998) concluded that handwashing should be targeted as the primary infection control measure.

Foodborne pathogens include a wide array of microorganisms which have various physiologic effects on people, ranging from mild to severe, and are associated with a wide array of foods. Inadequate handwashing by food workers has been identified as one of the most common causes of foodborne illness of microbial origin. Pathogens that are easily transmitted from individual to food include; *Salmonella*, Norovirus, *Shigella*, *Escherichia coli* (*E. coli*), and Hepatitis A (McSwane, Rue, & Linton, 2003).

Contaminated raw products such as raw meat, poultry, fish, unwashed fruits and vegetables carry both the *Salmonella* bacteria and Norovirus. Both *Salmonella* and Norovirus can attach themselves to fingertips and fingernail surfaces when food workers' handle high risk foods. *Salmonella* is found in the intestines of birds, reptiles and mammals. It is easily transferred among humans and animals via both direct and indirect contact, and will multiply rapidly in uncooked foods left at room temperature. *Salmonella* can cause salmonellosis in humans, an illness characterized by fever, diarrhea and abdominal cramps. It can invade the bloodstream and cause life-threatening infections in weaker individuals. Noroviruses occur in contaminated water, ice and shellfish. They can also be present on the hands of food workers and from there contaminate any foods likely to be eaten without a heating step, such as salads, fruit, sandwiches and bakery products. Norwalk viruses will cause a sudden and violent onset of vomiting and/or diarrhea accompanied by headache and abdominal discomfort (Lane, 2001).

Shigella are facultative anaerobic bacteria commonly found in the intestines and feces of humans and warm-blooded animals. They cause the foodborne infection, shigellosis. Diarrhea, fever, abdominal cramps, chills, fatigue, and dehydration are

symptoms of shigellosis. This organism is common in ready-to-eat salads, milk and dairy products, poultry, raw vegetables, and any food contaminated by feces that contain the microbe. Workers who are carriers of shigellosis can contaminate foods during food preparation (McSwane, Rue, & Linton, 2003).

Most varieties of *E. coli* serve useful functions to animals, including humans by residing in the intestines and suppressing the growth of harmful bacteria and synthesizing vitamins. However, the strain *E. coli* 0157:H7 is a rare variety that produces large quantities of toxins. Severe damage to the lining of the intestine is caused by these toxins and can result in hemorrhagic colitis which produces severe cramping and diarrhea, and in some victims can lead to renal failure. *E. coli* 0157:H7 has been found in foods such as undercooked beef and raw milk (Lane, 2001).

A foodborne illness that has been associated with many foodborne infections is Hepatitis A. Because food workers can harbor it for up to 6 weeks and not show symptoms of illness, the hepatitis virus is a particular hazard of concern to food establishments. Food workers are contagious for one week before onset of symptoms and two weeks after the symptoms of the disease appear. During that time, infected workers can contaminate foods and other workers by spreading fecal material from unwashed hands and nails. Hepatitis A is very hardy and can live for several hours in a suitable environment. The symptoms of infectious hepatitis are fever, nausea, vomiting, abdominal pain, and fatigue. Potentially hazardous foods such as prepared salads, sliced luncheon meats, salad bar items, sandwiches, and bakery products can carry Hepatitis A if the food is mishandled by an infected food worker (McSwane, Rue, & Linton, 2003).

Given the large numbers of people that dine out, one food handler who fails to practice proper handwashing can contaminate food that is then served to many people. Each year, the food service industry produces sales of more than \$300 billion dollars and provides jobs to nearly 10 million employees (National Restaurant Association, 1997). In 1996, the typical consumer more than 8 years of age had more than four meals per week away from home (Collins, 1997). These statistics show the

crucial role handwashing has in maintaining food safety in food service establishments.

In recent years, some of the larger outbreaks of restaurant food poisonings have been linked to inadequate or lack of handwashing. DeWall (1996) presented a synopsis of the following recent outbreaks. In June 1996, 38 people became ill from food contaminated with *Salmonella* served in a Wendy's restaurant in suburban Boston. Investigators determined the outbreak was caused by employees who did not wash their hands before handling food. An outbreak of 95 cases of Hepatitis A was traced to an employee of a Taco Bell restaurant in Salt Lake City in 1995. In June 1993, a Mexican restaurant in a Chicago suburb served *Salmonella*-tainted food that sent 25 people to the hospital and sickened 16 others. County investigators attributed the outbreak to prepared food not being held at hot enough temperatures, and to poor food handler hygiene. (DeWall, 1996). These outbreak descriptions demonstrate the essential link between food worker handwashing practice and the prevention of microbial infection.

Food Workers' and Health Care Workers' Handwashing Practice

Because hands are known to transmit disease, a number of studies have examined the handwashing practices and attitudes of health care workers towards handwashing in clinical settings. Extensive medical literature on the relationship between handwashing and nosocomial infections is available (Fendler, Dolan, & Williams, 1998). Although the tasks and duties of food service workers and health care workers differ, their situations are comparable. Both professions have challenging work schedules, are physically demanding and involve the important task of handwashing to protect the public from infection and disease.

A review of handwashing guidelines show that individuals working in the industries of health care and food service must follow similar regulations. A comparison of the CDC Guidelines for Hand Hygiene in the Health-Care Setting and the Oregon Department of Human Services Food Safety Training Manual illustrates a

common theme in handwashing guidelines (Boyce & Pittet 2002 ; Oregon Department of Human Services, 2002). Washing hands before and putting on gloves, scrubbing for at least 15 seconds, using a disposable towel to dry off, washing hands after using the restroom and keeping nails short are examples of guidelines implemented by CDC and Oregon DHS. Despite a wide range of guidelines, educational resources and programs, personnel in both the health care and food service industries have poor handwashing habits (Emery, 1990).

Research shows that health care workers still neglect to wash their hands, in spite of the eminent benefits of handwashing. An observational study of health care workers' handwashing practices in an Ohio hospital revealed a 30.2 percent handwashing guideline compliance rate (Watanakunakorn, Wang, & Hazy, 1998). In the largest hospital-wide handwashing observation ever conducted, 2,834 opportunities for handwashing were observed with an average compliance rate of only 48 percent (Pittet, Mourouga, & Perneger, 1999).

Poor handwashing practice by food workers has also been observed in restaurants. Manning and Snider (1993) observed 47 food workers preparing menu items such as hamburgers, fried chicken, crabcakes and pork sandwiches at the Delaware State Fair. All the vendors had handwashing sinks for workers but only one worker was observed to use handwashing procedures.

Researchers who observed and documented handwashing practices and prevalence of university food workers noted several instances of insufficient and absent handwashing. Food workers were observed not handwashing when reporting for work, duty, or returning from break. One employee was observed washing hands approximately 30 minutes after reporting to work after food preparation had already been initiated (Witten, 2001).

Factors Influencing Food Workers' Handwashing Practice

A number of different factors can contribute to food workers' ability to implement correct handwashing practice. However, only a few studies have been

carried out to determine the barriers and problems which may prevent food workers from implementing good handwashing practice in restaurants (Clayton, Griffith, Price, & Peters, 2002). Because only a few studies have been done involving food workers, many assumptions must be drawn from health care studies.

Barriers to appropriate handwashing practice have been reported in various health care handwashing studies (Conly, Hill, Ross, Lertzman, & Louie, 1989; Donowitz, 1987; Kretzer, & Larson, 1998; Larson, & Killien, 1982; Larson, & Kretzer, 1995; Pittet, Mourounga, & Perneger, 1999; Sproat, & Inghs, 1994). Reasons reported by health care workers for lack of handwashing include skin irritation, inaccessible supplies, interference with the relationship to patient, needs of patient perceived as priority, wearing gloves, forgetfulness, ignorance of guidelines, insufficient time, high workload and understaffing, and insufficient scientific information showing how improved handwashing reduces infection rate. The following studies illustrate the numerous existing barriers to handwashing in healthcare settings.

A study examining the handwashing decision-making process of health care workers found the two major contributors to infrequent handwashing were that frequent handwashing was detrimental or drying to the skin and that it was not common for peers to wash their hands (Larson & Killien 1982). Lankford, Zembower, Trick, Hacek, Noskin, & Peterson (2003) found that role models have a significant influence on the handwashing practice of health care workers. The researchers assessed the presence of medical staff role models and demonstrated that health-care workers were much less likely to perform hand hygiene if a peer or a higher ranking person in the room did not perform handwashing.

Additional factors influencing handwashing in the health care environment include the priority the health care institution places on handwashing, an institutional climate that encourages safety, and administrators that actively support handwashing (Dubbert, Dolce, Richter, Miller, & Chapman, 1990). These health care studies offer a foundation for developing further studies and questions addressing food workers'

handwashing practice in the restaurant environment and the effect of factors such as sink location, lack of time and influence of peers and management.

Findings similar to health care research have been noted in studies examining food workers' barriers to handwashing. A study of a Norovirus outbreak identified food handling practices, food handler perceptions, and hotel kitchen policies as potential routes of foodborne illness transmission (Dippold, Lee, Selman, Monroe, & Henry, 2003). In a handwashing study by Howes (1996), lack of supervisory and/or peer support, and lack of provision of proper equipment; sinks, hot water, and soap were significant factors in preventing adequate handwashing.

Clayton, Griffith, Price & Peters (1994) administered questionnaires to 137 food workers to determine their awareness of food safety actions, barriers to implementing food safety practices, and their perception of the risk of food safety. Generally, food workers were aware of the food safety actions they should be carrying out but identified a number of barriers which prevented them from implementing these practices. These barriers included lack of time, lack of staff and lack of resources. Both the health care worker and food worker studies demonstrate that multiple factors influence handwashing behavior. External factors such as sink location, lack of time and influence of peers and management greatly influence food workers' and health care workers' handwashing practice. Also, although 95 percent of the survey participants received food hygiene training, 63 percent admitted to sometimes not carrying out food safety behaviors.

Fifty-five university food workers were asked fill out an employee questionnaire measure levels of handwashing importance and to indicate the main reason why they did not wash their hands. Fourteen workers indicated that there was no reason not to wash hands and that they often washed their hands. Sixteen food workers indicated that they did not wash hands because gloves were often changed. Busy work schedules and handwashing facilities too far from work were other reasons for not washing hands (Witten, 2001).

Interventions to Improve Handwashing Practice

Because data suggest that most outbreaks result from faulty food handling practices, there is a belief that the incidence of foodborne illness could be reduced by providing education and training to food workers (Bryan 1998; Davey 1985; Roberts 1982). Many private and government agencies recommend education and training for food workers to respond to the lack of adherence to handwashing recommendations. The National Restaurant Association (NRA) has recommended training the approximately eight million restaurant employees as the most effective way to address inadequate handwashing (Lynn, 1996). In 1998, forty-three million dollars was budgeted by the United States government for a food safety initiative aimed at improving the safety of the nation's food supply. Main points of the food safety initiative were to expand existing surveillance programs, coordinate federal and state efforts in dealing with foodborne outbreaks, revise the inspection of commercial food processors, and improve employee training about the proper handling of food (Marwick, 1997).

Despite these recommendations and initiatives, most food workers receive little or no training about correct handwashing procedures (Snyder, 1998). The majority of studies examining the handwashing practice of food workers who do receive handwashing training conclude are ambivalent about the impact of handwashing knowledge on the quality of handwashing practice. Because of these findings, there is uncertainty regarding the efficacy of current handwashing training.

Currently, there is a disparity between knowledge provided to food workers and handwashing practice. Epidemiological evidence shows that failure to apply learned techniques is a factor in food-borne disease causation (Bryan, 1998). However, studies which have directly assessed the correlation between food safety/handwashing knowledge and practice, have shown an unpredictable relationship (Oteri & Ekanem, 1989; Manning & Snider, 1993). A number of studies have indicated that an increased knowledge of handwashing does not always cause handwashing behavior to improve.

A written test instrument developed to compare level of food safety knowledge to handwashing practice was administered to a group of thirty food service managers at the start of a training course. Participants responded to statements concerning handwashing habits based on personal observations and practices and to factual questions based on their knowledge of food safety. Results revealed that knowledge of food safety did not correlate with handwashing habit. (Emery, 1990).

Lynch, Elledge, Griffith & Boatright (2003) administered a survey to restaurant managers designed to measure their understanding of basic food safety principles. The sources of training, certification, and experience were found to significantly affect the level of food safety knowledge. Health department training appeared to provide the most effective food safety education. Food service managers with health department training demonstrated a greater knowledge of food safety than did food safety managers with corporate training. However, increased hours of any type of training did not increase knowledge. In addition, the time lapsed since training did not significantly affect the level of knowledge.

Studies measuring health care workers' adherence to handwashing recommendations also demonstrate that education and training interventions have limited success in promoting long-term handwashing practice (Bischoff, Reynolds, Sessler, Edmond, & Wenzel, 2000). A variety of interventions such as in-service education, distribution of information leaflets, workshops and lectures, and performance feedback on compliance rates have been implemented with minimal handwashing improvement (Pittet, 2001).

McKeown and Williamson (1992) reported that there was no difference in handwashing practice between staff in a hospital who had knowledge of infection control guidelines and those who did not. Health care workers' handwashing rates were measured at 30 percent after a handwashing intervention program that included a video-taped demonstration, written instructions, educational presentations, mailings and refresher sessions. Roberts, Bolton and Asman (1998) conducted a survey that showed health care staff had a high awareness of policy regarding infection control,

but only 45 percent of staff complied with handwashing recommendations. Successful strategies and tools are needed to improve handwashing compliance rates of both health care workers and food workers.

A preliminary tool has been developed by Larson (2004) to assess barriers to handwashing in the health care environment. The tool was created to provide an opportunity for engaging staff in efforts to improve handwashing practice. The tool is a survey that uses a 6-point Likert scale questionnaire to measure attitudinal statements about handwashing practice guidelines. In addition, the instrument asks the respondent to name the most important factors that would either facilitate or prevent them from following recommended handwashing guidelines. Such a tool could also be beneficial in understanding factors influencing food workers' handwashing practices.

Understanding the motivations of food workers in relation to handwashing is essential to developing interventions that will promote good handwashing practice. A critique of current handwashing interventions is necessary. Researchers have indicated that too little emphasis is placed on changing individuals' beliefs and attitudes. It has been suggested that the disparity between knowledge and practice occurs because much of the existing training is designed using the KAP model (Clayton, Griffith, Price, & Peters, 2002). This approach assumes that an individual's behavior or practice is dependent on their knowledge and that provided information will result in a change in attitude and behavior. Ehiri and Morris (1994) proposed that training of food workers is more likely to be successful if factors such as management support, employee motivations, and environmental and resource constraints are considered.

Managerial support and organization culture have both been identified as an important factor in the implementation of successful handwashing interventions. The effectiveness of a training program is dependent on the attitude of managers and the hygiene culture of an organization (Hennum et. al., 1983; West, 1992; Crowther et al., 1993). Because managers play an influential role, education and training should be taught to restaurants as a whole learning unit rather than to individual food workers.

This way, the manager can become familiar with the education and training program and adjust restaurant handwashing policies as needed to support the training program in practice (Howes, 1996). Managers can also demonstrate their support by including correct handwashing training as a critical component of new food worker orientation. Researchers have also reported that owners and managers should regularly compliment employees for using correct handwashing procedures, provide clean, well-maintained handwashing facilities in kitchen and restroom areas, and share customer and health department compliments with employees (Snyder, 1998).

Food worker handwashing practice is a complex issue that requires an understanding of many variables to develop effective interventions. In recent years, both private and government agencies have initiated efforts to design handwashing education and training to address the barriers and constraints of food workers related to handwashing. The National Restaurant Association is also focusing on training needs of restaurant establishments by identifying barriers to food safety and handwashing in the workplace (Hernandez, 2001). Health departments have also started to develop educational interventions based on handwashing barriers identified during outbreak investigations.

After poor handwashing practice was identified as a potential route of Norovirus transmission at a hotel restaurant, a local health department identified the training needs of food workers and implemented necessary interventions. Handwashing training was provided to all kitchen staff, and recommendations were made for developing food safety policies and training procedures that reinforced handwashing educational messages (Dippold, Lee, Selman, Monroe, & Henry, 2003). This study demonstrates how health departments can successfully provide assistance to restaurants by proactively identifying the factors influencing handwashing and providing educational interventions. Improvement in handwashing practices requires questioning basic beliefs, continuous assessment of factors influencing behavioral change, and interventions based on the processes of change (Kretzer, & Larson, 1998).

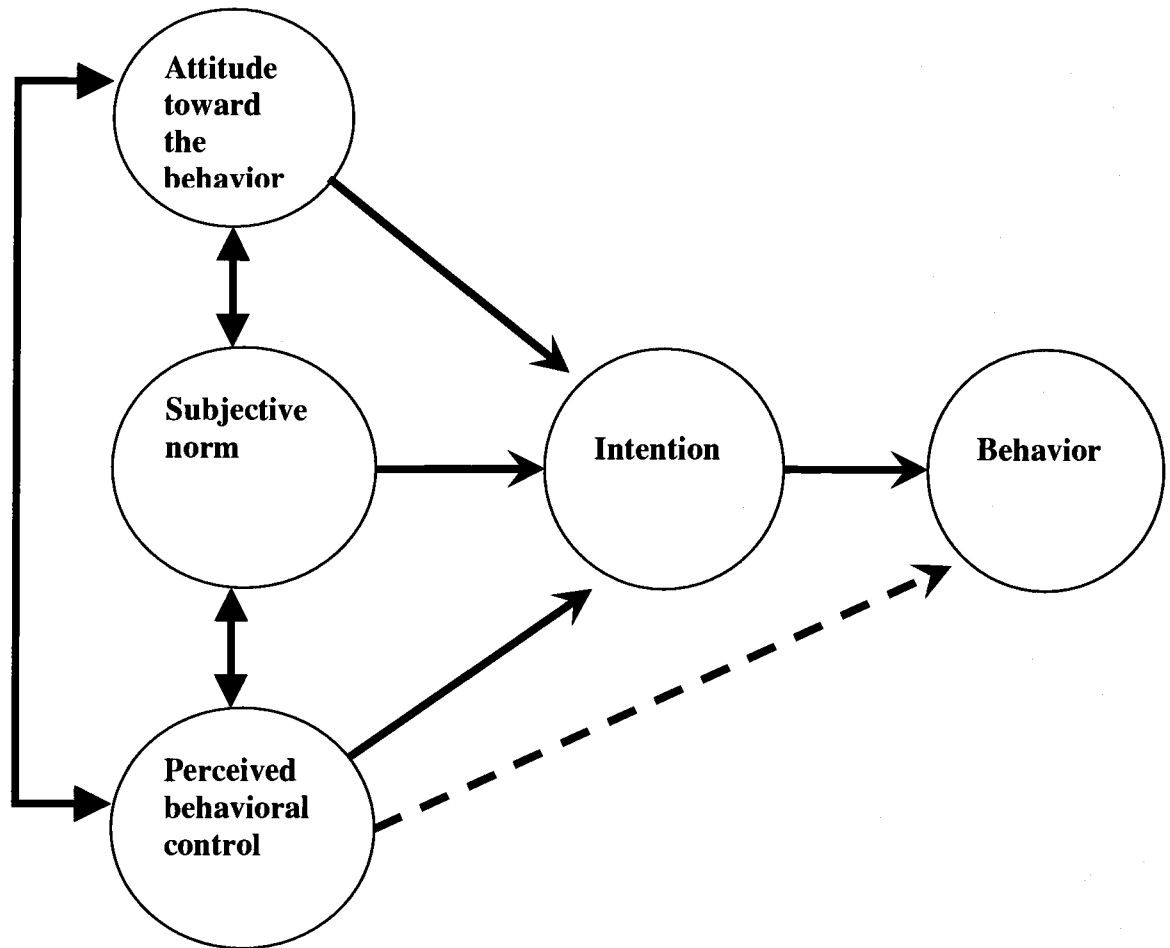
Description of the Theory of Planned Behavior

The need for further investigation is evident when taking into consideration the various factors affecting food workers' handwashing. One of The Centers for Disease Control and Prevention recommendations for future research in the health care industry is to "assess the key determinants of hand hygiene behavior and promotion among different populations" (Boyce and Pittet, 2002). Because handwashing behaviors are multidimensional and occur in a continually changing environment, a theoretical framework is necessary (O'Boyle, 1998). Understanding the handwashing beliefs, attitudes, perceptions, intentions and motivations of food workers, in the context of a theoretical framework is helpful in planning interventions that will support appropriate handwashing behavior.

Researchers have argued that the effectiveness of food worker training could be greatly improved if it was designed using health education and psychological theory (Ehiri et. al., 1997; Griffith, et. al. 1995; Rennie, 1995; WHO, 1998). The Theory of Planned Behavior (TPB) is a theoretical framework that has proven to be helpful in understanding and predicting handwashing behavior of health care workers (O'Boyle, 1998; Jenner, Watson, Miller, Jones & Scott 2002). The TPB framework has also been utilized to examine food workers' beliefs and self-reported food safety practices (Clayton, Griffith, Price, & Peters, 2002), but this is the first study to implement the TPB in understanding food workers' handwashing practices.

The TPB consists of constructs believed to predict intention to perform behavior (Jenner, Watson, Miller, Jones & Scott, 2002). According to the TPB, a central factor in predicting behavior is an individual's intention to perform a behavior. Intention to perform a behavior is based upon the attitude towards the behavior, subjective norm and perceived control. The precursors to attitude, subjective norm and perceived behavioral control indirectly influence intention and the performance of the behavior. Attitude is determined by a person's view about the importance of an outcome, and the strength of his or her belief about the specific outcomes of a behavior (Ajzen, 1988).

Figure 1
Theory of Planned Behavior



Source: (Ajzen I., 1986).

Attitudes refer to an individual's overall assessment of the advantages and disadvantages of their performing the behavior (e.g., "For me, washing my hands would be worthwhile/not worthwhile"). A person's perception of social pressure from others to perform the behavior is subjective norm e.g., "My coworkers think that I should wash my hands"). Perceived behavioral control is usually measured by an

individual's perception of the ease or difficulty of performing the behavior (e.g., "For me washing my hands would be easy/difficult"). The TPB model postulates that a person will have a strong intention to perform a behavior, such as handwashing if they have positive attitudes, subjective norms, and perceived behavioral control. Furthermore, the stronger the intentions, the more likely an individual is to perform the behavior (Sheerman & Silverman, 2003).

An application of the TPB to measure handwashing attitudes, subjective norms, perceived control and outcome beliefs is the Handwashing Assessment Instrument developed by O'Boyle (1998). 120 nurses participated in the study in four metropolitan hospitals. All of the predictor variables of the TPB had significant correlations with intention to adhere to handwashing guidelines. This application of the TPB model showed that internal motivational factors are not as influential as external (system or work-related) factors to health care workers' handwashing practice.

Jenner, Watson, Miller, Jones, & Scott (2002) administered a cross-sectional survey based on the TPB to 104 participating health care workers in a teaching hospital to identify psychological constructs predictive of health care workers' handwashing behavior. A successful model was produced explaining health care workers' intention to perform handwashing. Attitudes and personal responsibility were both significant predictors of intention. However, neither subjective norms nor perceived behavioral control significantly predicted intention. The health care studies conducted by O'Boyle (1998) and Jenner, Watson, Jones and Scott (2002) demonstrate how the TPB can be used as a basis for developing a model to understand handwashing practice.

The TPB was applied in this study to measure handwashing attitudes, subjective norms, perceived control and outcome beliefs of food workers to identify perceived cognitive and physical factors that may explain food workers' handwashing practice. It is hoped this research will be useful in designing interventions to improve food workers' adherence to recommended handwashing guidelines.

Focus Group Research

Utilizing focus groups as a means to design questionnaire surveys has been recommended by many social scientists (Fuller, Edwards, Vorakitphokatorn, & Sermsri, 1993; Hughes & DuMont, 1993; Laurie & Sullivan 1991). Focus groups serve as a valuable resource in survey design by encompassing all dimensions that need to be measured in the survey, determining to what extent these dimensions define the perceptions of the population of interest, and by providing item wording to convey researcher's intent to the survey participant (Morgan, 1997). Group discussions produce ways for survey development to be a type of collaborative project where members of the population of interest contribute their unique ideas to the survey design.

A formative research stage is required in developing a TPB research model. Open-ended questions should be presented to the target population to determine beliefs about the specified behavior (Clayton, Griffith, Price, and Peters, 2002). Interactions between participants allow for observing, understanding and analysis of the agreement or disagreement between participants concerning identified topics (Chioncel, Van der Veen, Wildemeersch & Jarvis, 2003). For this research study, two focus groups were conducted with the target population (food workers), to better understand the behavior (handwashing). The purpose of such a focus group design was to involve food workers in not only exploring handwashing knowledge, attitudes, practices and barriers, but also to start a collaborative action to formulate solutions (Chioncel, Van der Veen, Wildemeersch & Jarvis, 2003). The focus groups results were used to develop the questions of the TPB food worker handwashing survey. Because the target population was involved in identifying key aspects of handwashing practice, the TPB surveys will address topics relevant to food workers in the restaurant environment.

METHODOLOGY

Overall Strategy

This research followed up the Oregon Department of Human Services baseline study conducted in March 2002-2003, and was developed to further explore the reasons for the poor handwashing practices observed during the baseline study. This handwashing study was designed with multidimensional study tools to include: 1) a focus group conversation with questions to food workers to develop an initial understanding of knowledge practice and attitudes relating to handwashing; and, 2) surveys administered to food workers to provide a more quantitative assessment of the key issues addressed during the focus groups. A description of the focus group and survey techniques and research methods are as follows.

Informed Consent Process

Informed consent was obtained from both focus group participants and survey participants. The study was explained verbally and potential participants were given an opportunity to read the written consent form and ask any questions. Potential participants were also informed that they had the option of withdrawing at any time. Both parts of the study were approved by the Oregon University's Institutional Review Board for the Protection of Human Subjects. The study was also approved by the Oregon Department of Human Services Institutional Review Board.

The Focus Group Technique

Focus groups are unstructured interviews with small groups of people who communicate with each other and a group facilitator (Bowling, 1997). Conducting focus groups is a useful technique for exploring values and beliefs about health practices. In recent years, focus groups have become popular in the field of public health. It has been shown that the group process can help participants explore their

views and generate questions in ways they would find more difficult in face-to-face interviews (Kitzinger 1996). Research studies have utilized focus groups to examine topics such as barriers to prenatal care, designing community health programs, and exploring perceptions of smoking (Madsen, Kowalik, & Smuckler, 2002).

Careful planning must be made during focus group recruitment, design and preparation to assure that certain objectives are met. First, participants must be a group of people with knowledge and experience in the defined area of interest. Second, discussion should be centered around clear, well-thought out questions that provide useful information for analysis.. Third, focus groups should be carried out in a permissive and nonthreatening environment (Krueger, 2000). This research was to explore handwashing knowledge, attitudes, practices and barriers in the restaurant environment by conducting two focus groups with food workers. Food workers participating in the two focus groups served as “panels of experts” involved in a cooperative exploration of handwashing practices based on participants’ experience in restaurants.

Focus Group Methods

Setting

Focus group research was conducted in Multnomah and Benton counties in Oregon, during the month of January, 2004. A trained facilitator, who had previous experience leading focus groups, asked participants a set of questions concerning handwashing knowledge, attitudes, practices and barriers. Each focus group session lasted approximately 1 ½ hours, and the sessions were audio tape- recorded.

Sample

Eighteen food workers agreed to participate from the 150 randomly -selected restaurants where food workers were invited to participate in the focus groups. Participants from Multnomah County and participants from Benton County were recruited. A focus group was conducted in each county. Each focus group consisted

of nine participants. Food workers participated in the focus group conducted in the county where their restaurant of employment was located. Food workers who had been currently working in a restaurant kitchen handling food for at least three months were eligible for participation. Participants had to be eighteen years of age or older. The participant population was not restricted to any gender or ethnic groups but had to be fluent in English.

Recruitment

Food workers were invited to participate in the focus groups through recruitment phone calls to their restaurants (See Appendices B and C). Restaurants to which recruiting calls were placed were randomly chosen from a list of all restaurants in Multnomah and Benton Counties provided by County Environmental Health Supervisors. The recruitment script was designed to recruit food workers who were able to attend an evening focus group during their personal, non-work time. The recruiting call served as an invitation to food workers to be a part of the study. The call outlined the study design, risks, benefits, compensation and informed consent process.

Food workers were not asked to make an immediate decision as to their participation. They were provided with a phone number to call if they were interested to participate. Food workers then had the opportunity to contact the researcher via the phone if they were interested in participating. This allowed the respondent time to make a decision without the influence of the researcher during the phone call.

Food workers who contacted the researcher and agreed to participate were asked to provide their phone number and mailing address, so a reminder phone call could be made. In addition, each participant was sent an information packet including the informed consent document and a reminder letter. Several days before the scheduled focus groups, participants received a reminder letter and a reminder telephone call the day before the scheduled focus groups (See Appendix D).

Managers were also contacted through an informational letter that discussed the ramifications of the study, and the possibility that one of their employees might be participating in the study (see Appendix A). To protect the confidentiality of the employee, only general information about the recruiting call and focus groups were provided. Managers' were provided with a contact person to call with any questions or concerns regarding the study.

Design of Focus Group Questions

The questions were designed in an open-ended, conversational sequence to create an informal social environment for participants to comfortably share their knowledge, attitudes, practices and perceptions of handwashing in restaurants. Each question played a specific role in helping participants transition from broad to general topics. The categories of opening, introductory, key, and ending questions were utilized during the focus groups.

Opening Question

- 1) Would you please briefly introduce to us what kind of restaurant you work for, what kind of work you do in that restaurant and how long you have been working in restaurant kitchens?

The intent of the opening question was to help people feel comfortable and begin conversation. The question began the process of encouraging all participants to contribute to the discussion. Participation from everyone early in the focus group is important. An immediate verbal contribution from each group member increases the likelihood of individual discussion participation throughout the focus group (Krueger, & Casey, 2000).

Introductory Question

- 2) What do you do to wash your hands in the workplace?

The intent of the introductory question was to identify the primary topic of handwashing and provide a way for participants' to give a description of their handwashing practice, knowledge and personal connection to the issue. This question also gave the focus group facilitator and researcher an indication of what major themes would emerge.

Key Questions

- 3) What gets in the way of you washing your hands or others washing their hands?
- 4) What do people need in your workplace to wash their hands the way the guidelines recommend?

The intent of the key questions was to examine the focus group topics of handwashing attitudes and barriers. Because these questions were more exploratory, they were given the majority of discussion time and required the greatest amount of time during analysis.

Ending Question

- 5) Are there any last comments or questions before we wrap up this evening?

The intent of the ending question was to bring closure to the focus group and to elaborate on main themes identified by participants. This question ensured that all participants have had the opportunity to include additional comments and remark on key areas that may have been overlooked (Krueger, & Casey, 2000).

Focus Group Analysis

Transcripts of the focus groups were used as the basis for the analysis along with field notes taken by the researcher. The researcher implemented the long-table

approach to identify themes and categorize results. The long-table approach is a simple analysis method that has been used in many analysis projects (Krueger & Casey, 2000). The following steps were taken by the researcher. Two hard copies were made of each focus group transcript (one to cut up and one to stay intact). Focus group transcripts were cut with scissors into individual quotes. To ensure quotes could be matched to focus groups, transcripts from each focus group were printed in separate colors. The researcher did a thorough reading of the transcripts to begin identifying common themes. Themes were identified by taking into account the theory that “meanings can only be understood in relation to the larger whole, whether it be the culture, the sentence or the narrative” (Hollway & Jefferson, 2000). In this way the researcher did not simply look for keywords or phrases but sought an understanding of how the dialogue shared by participants illustrated their thoughts and practices as a whole. Quotes were then arranged on poster boards based on common themes. Finally, a descriptive summary of the common themes was written.

Survey Methods

Setting

Surveys were facilitated in Oregon restaurants in Multnomah and Benton counties during the month of May 2004. Upon agreement of the restaurant manager, the researcher visited each restaurant and provided a surveys for food workers to complete at the restaurant at a convenient time. The survey took approximately 5 minutes for food workers to complete.

Sample

Twenty-three restaurant managers agreed to have the researcher administer surveys to food workers from the 250 randomly -selected restaurants invited to participate in the handwashing survey study. Restaurants to which recruiting calls were made were randomly chosen from a list of restaurants in Benton and Multnomah

County provided by County Environmental Health Supervisors. All available food workers from each restaurant were invited to complete the survey. Food workers who were interested in participating in the study were given a survey to complete. Out of the 23 restaurants participating in the study, 31 food workers filled out surveys. Participants from Multnomah County and participants from Benton County were recruited. Food workers who had been currently working in a restaurant kitchen handling food for at least three months were eligible for participation. Participants had to be eighteen years of age or older. The participant population was not restricted to any gender or ethnic groups but must be fluent in English.

Recruitment

The survey was first pilot tested by 5 Benton County food workers prior to distribution of the survey to the study participants. Comments given by those individuals included in the pilot test were considered in revising the survey. Restaurant workers who participated in the pilot test were not recruited to be in the study.

The following methods were followed during recruitment:

- 1) A pre-survey letter was sent to restaurant managers to let them know their restaurant might be picked at random to receive a call inviting them to participate in a survey study (See Appendix H).
- 2) Restaurants picked at random were invited to participate in the study through recruitment phone calls to the manager. The recruitment script was designed to recruit restaurants that were interested in participating in the survey. The recruiting call served as an invitation to managers to have their restaurant included as a part of the study. The call outlined the study design, risks, benefits, and informed consent process (See Appendix G).

- 3) During the call, if a manager was interested in having their restaurant participate, a date and time was set for a researcher to visit their restaurant and administer the survey.
- 4) Managers who agreed to have their restaurant participate in the study received a letter confirming the date and time a researcher would visit the restaurant to administer the survey. Recruitment flyers were also included with the manager letter to serve as an invitation to food workers to complete a survey. The manager was asked to provide food workers with copies of the recruiting flyer. The flyer outlined the date and time of the survey at their restaurant, study design, and informed consent process. (See Appendix I).
- 5) Each restaurant was visited at a mutually agreed time and all available food workers were invited to complete a survey. All the surveys were completed and returned to the researcher during the visit. This method of data collection ensured that participants a) were able to answer questions in their work environment; b) were able to ask the researcher if they have any queries; and, c) ensured that other employees/employers did not have access to their responses.

Design of the Survey Instrument

Two previous surveys were utilized in developing the survey instrument for this survey. Questions from a survey developed for health care workers by O'Boyle (1998) were adapted to apply to food workers in restaurants. This survey was designed to specifically collect data regarding the specific variables regarding handwashing: beliefs about outcomes, attitude, subjective norm, control, perceived control, intention, barriers and self-reported behavior. Components of a Theory of Planned Behavior survey designed to measure food safety practices was also utilized

(Clayton, Griffith and Price, 2002). Recommendations by Aday (1996) for developing surveys were useful in developing the instrument. The Statistical Consultation Center at Oregon State University assisted the researcher in designing the survey to improve readability of the questions. The instrument was then reviewed by the following persons for content validity: 1) four food safety professionals who work with restaurants, 3) one extension specialist and, 4) four public health professionals. Four lay persons reviewed it for readability of questions ease of understanding by respondents. It was then revised before being pilot tested. Sections of the questionnaire are briefly described as follows:

Beliefs About Outcomes

12 items were designed to measure the participants' beliefs about the outcomes of handwashing. This set of questions (Q4a- Q5f) focused on food workers' cognitive assessment of handwashing such as, "If I regularly wash my hands at work, I will protect restaurant workers from food illness." Responses were measured on a five point Likert scale with 1 assigned to "I strongly disagree" and 5 assigned to "I strongly agree." There was a parallel weighting item for each of the items measuring beliefs about outcomes of handwashing. Food workers were asked to indicate the importance of each possible outcome. Each item was measured on a five point Likert scale from "not very important to me" to "very important to me." Thus cognitive assessment (Q4a-4f) and evaluation of outcomes (Q5a-5f) were calculated as follows to compute the beliefs about outcomes score:

$$\sum \frac{\text{beliefs about outcomes} \quad (\text{x}) \text{ evaluation of outcomes}}{n \text{ of beliefs about outcomes}}$$

Attitude

5 items were designed to measure the participants' attitudes about handwashing. This set of questions (Q7a-Q7d) focused on food workers' emotional

assessment of handwashing. Responses were measured on a five point likert scale. The following is an example of an attitude item: “To me handwashing at the right time is “frustrating” to “not frustrating.”

Subjective Norm

This part of the survey (Q6a-Q6b) asked participants to indicate their level of agreement or disagreement with the following two statements: “My coworkers want me to wash my hands when I am supposed to” and “My manager wants me to wash my hands when I am supposed to.” The purpose of the questions was to represent how food workers perceived the handwashing support they received at their restaurant. A five point likert scale from “I strongly disagree” to “I strongly agree” was used on the response scale.

Intention

3 items were designed to measure the participants’ plan to handwash in a variety of situations. This set of questions (Q9a-Q9c) were measured on a five point likert scale from “very likely” to “very unlikely.” The following is an example of an intention item: “During a busy time at the restaurant, I intend to wash my hands.”

Perceived Control

This part of the survey (Q8b) measured the degree to which food workers believed they could implement their intended handwashing practices. 1 item was used to measure perceived control. Respondents were asked to indicate their level of agreement or disagreement with the following statement: “I can easily find a way to regularly wash my hands at work.” Responses were measured on a five point scale from “I strongly disagree” to “I strongly agree.”

Self-reported Handwashing

One item was included to measure food workers' self-reported handwashing behavior. Participants were asked to indicate their level of agreement or disagreement with the following statement: "I always regularly wash my hands at work." Responses were measured on a five point scale from "I strongly disagree" to "I strongly agree."

Demographic Information

This part of the survey asked for information about gender, age, ethnicity and education level. Other demographic information included length of time working in restaurants and type of restaurant currently working in.

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS for Windows, 11.0). The variables in the study included: Demographic data (participant's age, gender, ethnicity, years working in restaurants, educational level, and ownership and type of restaurant), and handwashing survey variables (beliefs about outcome, attitude, intention, subjective norm, perceived control, and self-reported handwashing behavior). Internal consistency reliability analyses for the scaled items were computed. Descriptive statistics such as frequency distributions, measures of central tendency (mean and median) and measures of dispersion (standard deviation), were conducted. Finally, Pearson's Product Correlation analysis was performed to determine the relationship between variables.

RESULTS

Focus Group Analysis

The results and discussion of the focus group analysis are presented in this section. From the open-ended questions posed to the focus groups participants, three general themes emerged, including handwashing knowledge, barriers to handwashing, and factors that promote handwashing. The participants provided a detailed and personal description of the challenges facing food workers when trying to practice proper and adequate handwashing in the restaurant environment. In general, responses generated from both focus groups were similar; thus, the findings for these groups are presented together.

Research Question 1

The first research question sought to determine the food workers knowledge of handwashing practices. Participants discussed the areas of handwashing materials, practice, situations and glove use in relation to handwashing. Focus group results for question 1 are described below.

Handwashing Knowledge

Handwashing Materials

When asked to describe what they used to wash their hands at work, respondents identified soap and hot water, paper towels, hand sanitizers and bleach. Some respondents from both groups said hand sanitizers were not a substitute for handwashing but had seen other workers use hand sanitizers without washing hands (e.g., “A lot of people think once they sanitize their hands they don’t have to wash their hands. They use it as an alternative.”)

One of the two focus groups discussed the use of bleach as a replacement for handwashing. The participants of this group identified “bleach buckets” as a sufficient way to clean hands (e.g., As long as everybody keeps a bleach bucket at every station

where you work, that is more than reasonable than washing your hands, because when you wash your hands you don't get every part of your hands.") Several respondents said bleach buckets were primarily used when working on the "cook line" or at the "grill". Respondents from both groups said using bleach made their hands dry. A few participants said they would rather wash their hands if possible instead of using bleach buckets (e.g., I continually wash my hands all day long. If I have a sink with soap, I'm more likely to do that. I'm less likely to use bleach if I have the option, just because my hands get tired of bleach all day.")

Practice

When asked to describe how they wash their hands at work, many respondents described similar practice. Respondents in both focus groups said they used warm water, scrub with soap, rinse with water for 10-20 seconds and dry hands off with a disposable towel. Several participants identified amount of time as the most important component of handwashing practice.

Situations

When asked to describe when handwashing was needed at work, respondents described many situations. Respondents in both focus groups said they washed their hands after touching areas such as face, nose, eyes or hair. Several workers said they wash their hands before food prep, after touching raw food, making salads, after going to the bathroom and after smoking. Respondents from both groups emphasized the importance of washing hands when sick (e.g., "If you're a line chef you're going to have to suck it up and get to work if you're sick. That's been my experience at pretty much all the restaurants I've worked at.") To a lesser degree, workers also said they washed their hands before handling money, after washing dishes, using cleaning products (e.g., to clean bathroom, kitchen floor etc.) and before putting on gloves or when changing gloves.

Glove use

Participants were asked when they used gloves at work. A variety of responses were provided by participants including: when handling raw meat, when they have cuts on their hands and when handling sticky products (e.g., sno-cones). A few participants said they washed their hands before and after glove use, but most participants said consistent handwashing during glove use was not a common practice (e.g., “I use disposable gloves, I use them for prep, take them off and go onto something else without washing my hands”). Several participants from both groups said they found glove use a nuisance (e.g., “Gloves are difficult to deal with because you have to take them off a lot. They get really dirty and when you make a salad, they just get covered with oil.”)

One worker said using tongs was a useful alternative to gloves (e.g., “I cannot stand wearing gloves. I only wear them when I have to. I try to keep to a minimal by using tongs”). Reasons for not using gloves included: gloves slow down food preparation process, they make hands sweat and break out into blisters, gloves are dangerous to use near an open flame, and gloves are dirty before use (e.g., hair and dust fall into the open glove box). Several participants reported unsafe glove practices— one worker reported using the same pair of gloves throughout the shift and pouring bleach water into the gloves to keep hands clean.

Research Question 1 Summary

Results from the focus groups indicate that most participants had an understanding of the steps necessary to adequately handwash. Respondents described the steps of: turning on warm water, scrub with soap, rinse with water for 10-20 seconds and dry hands off with a disposable towel. Participants also identified various situations when they believed handwashing was needed including: after touching areas such as face, nose, eyes or hair, before food prep, after touching raw food, making salads, after going to the bathroom and after smoking and when sick (participants knew that they should not be working when sick, but noted that due to various factors

such as “lack of staff” and “not receiving paid time off” they felt staying home when sick was not an option). Although food workers had knowledge of how and when to handwash, several participants said alternative practices to handwashing were implemented. The primary alternative practice identified was the use of “bleach buckets” as a replacement to handwashing. Participants said bleach buckets were used frequently on the cook lines.

Responses were also provided by participants in regard to glove use. Most participants said consistent handwashing during glove use was not a common practice. Several participants found glove use a nuisance and reported reasons for not wearing them including: gloves slow down food preparation process, they make hands sweat, are dangerous to use near an open flame, and are dirty before use.

Research Question 2

The second research question sought to determine the handwashing barriers that exist for food workers in restaurant kitchens. Participants discussed the areas of availability of supplies and sink accessibility, time pressure/high volume of business/stress, lack of accountability, type of restaurant/practice, training received at restaurant, and food handler card training. Focus group results for question 2 are described below.

Barriers to Handwashing

Availability of supplies and sink accessibility

Participants from both focus groups identified numerous situations when supplies were not available. Situations included: broken towel and soap dispensers, no hot water, no sanitation solution, no towels, and no soap. One participant said that the kitchen had different soap dispensers than the rest of the restaurant establishment, and that vendors would forget to bring soap that worked for the kitchen dispenser. Several participants said their kitchens had dealt with the supply issue by designating a person to be in charge of supplies for that day/week (e.g., “The person that’s in that position needs to take the initiative to get towels or soap”).

Time pressure /High volume of business/ Stress

Respondents felt that time pressure due to high volume of business had a significant impact on handwashing in restaurant kitchens (e.g., “Being really, really busy. If you’ve got like 6 guys on a line, to get to the sink you’ve got to push the guys out of the way and whoever is behind, so there is no way you can do it”). Respondents said the only way to “keep hands clean” during busy periods was to “have a bleach towel immediately right next to us to wipe our hands from time to time.” Respondents identified time pressure as a factor that negatively affected all food workers, regardless of how conscientious they were about handwashing.

Lack of Accountability

Participants from one of the two focus groups said lack of accountability was an issue in their kitchens (e.g., “I don’t think I could tell anyone that I work with that they need to wash their hands. I’d get some swear words back in my face”). Participants felt accountability had to be instilled by managers and also by peers. Several participants said having the manager spend frequent time in the kitchen caused coworkers to feel more accountable for their handwashing practice.

Type of restaurant/ practice

Comments suggested that handwashing practice was influenced by restaurant type, specifically whether the restaurant was a corporate chain or family-owned restaurant. Some participants felt that corporate business restaurants provided more handwashing training because they had the budget and staff to do so. However, comments were made that corporate chains did not focus much on handwashing training because they were more focused on “the bottom line of making money.” Other participants felt that family owned restaurants provided a “close connection” environment, which promoted handwashing practice because “people are there to help the business, they want to see positive results.”

Comments were also made that the way duties were delegated influenced handwashing. Workers felt that having one task made it easier to handwash than trying

to multitask (e.g., “You should have people who do dishes, you should have your cooks. Talking about crossing over means you’re constantly going from front to back”). Workers said having designated tasks made it easier to “learn your routine” and made people more accountable for their handwashing actions.

Training received at restaurant

Overall, workers from both focus groups felt they did not receive adequate handwashing training at their restaurants. Workers said that their employers did not take training seriously and it was assumed that new trainees should already know about handwashing. Comments were made that during training there was so much to go over, it was hard to remember to teach handwashing (e.g., “You’re going through so much material that the last thing that is on your mind is, oh, we’re going to stop and wash our hands”).

Food Handler Card Training

Respondents from both focus groups said the current Oregon food handler card test was not effective in teaching handwashing practice to food workers. Comments were made that the test was a “memorization thing” and didn’t provide any “hands-on training” that would instill proper handwashing practice. One respondent said the food handler card test was “insulting” because it didn’t have an educational component to it. On the other hand, several respondents said the food handler card taught food workers everything they needed to know.

Research Question 2 Summary

Participants described several barriers to handwashing in restaurant kitchens. These barriers included physical barriers, time constraints, and issues involving restaurant type, amount of management involvement and the need for education and training. Although several physical factors were identified, (inadequate supplies, broken equipment; towel and soap dispensers and sinks) most barriers to handwashing

related to the social environment. Participants said that having managers and peers who did not support handwashing had a negative impact in their restaurants. It was recognized that managers who spent frequent time in the kitchen created a situation where coworkers felt accountable for their handwashing and were more likely to implement correct practice.

Research Question 3

The third research question sought to determine the positive influences that promote food workers to handwash in restaurant kitchens. Participants discussed the areas of kitchen design and environment, health department and food inspectors, education and training, social environment, development of good handwashing habits, and personal beliefs and attitudes. Focus group results for question 3 are described below.

Positive Factors that Promote Handwashing

Kitchen Design & Environment

Participants identified several design and environmental factors that they felt positively impacted handwashing in their restaurant kitchens. These factors included: sink location and availability, having a sink designated for handwashing, size of kitchen, general cleanliness of sinks and kitchen environment, and having posters and signs reminding them to handwash. Participants said handwashing occurred more frequently in kitchen with sinks in close proximity of work area (e.g., “Our sink is so close to the front where we do food prep. You turn around and it’s there, even when we’re busy, people still take their time to wash”). One worker noted that a smaller kitchen made handwashing easier because the sink was always close and readily available. Several workers said cleanliness of the kitchen and sink areas had an effect on handwashing. Workers also said visual reminders such as posters and signs hanging above the sink and in the bathroom helped them remember to wash their hands. One

worker suggested having a sign that listed “top offenders” so that people would focus on the “important” times for handwashing.

Health Department & Food Inspectors

Participants in one of the groups said having involved and proactive health departments and food inspectors encouraged handwashing in kitchens. An effective health department was identified as one that combines both enforcement and education. Participants in the group said they felt their County Health Department provided handwashing education on a continuous basis (e.g., “I think the people in this county are fortunate to have a health department that provides education. I think the people in our business are really aware of the handwashing thing. It’s been brought up in this county now for 5 years”). Participants said a food inspector that effectively influenced handwashing possessed the following traits: (1) takes time to educate during inspections; (2) provides consultation and problem solving; (3) has enough experience to make suggestions for improving handwashing compliance; and, (4) doesn’t hesitate to say what is wrong and gives updates on upcoming changes. Although participants of the group noticed the benefits of an involved health department and inspector, participants felt an increased amount of time should be spent inspecting restaurants and providing education (e.g., “I think the frequency of inspections should be increased. They only come twice a year. We have that one inspection and then we start to slack”). One worker felt health departments and inspectors would be of more assistance if they knew more about how each individual restaurant kitchen operated (e.g., “It might give them other things to look for or set up other questions to ask if they see how the kitchen is run”).

Education & Training

Workers identified several areas where education & training could be improved to promote handwashing. These areas included: an explanation of types of foodborne illness and symptoms, and having the option of taking an in-depth class such as Servsafe. Workers from both focus groups said they would like to know more

about what foodborne illnesses are caused by workers not washing their hands during food preparation (e.g., “I am very curious. I know germs exist and they are out there. We hear about *Salmonella* and all that stuff. But I’m curious as to if we don’t wash our hands, what is the result? I think we should be educated because I don’t really know what happens. I mean yeah, you get sick. But what does *Salmonella* do to a person?”)

Several participants felt that workers would be more likely to handwash if they understood what could happen if they didn’t wash their hands. Workers from both groups mentioned Servsafe training as a way to provide handwashing training. Participants said this type of training provided hands-on practice for what people actually do in restaurant kitchens, and more informational training than received during food handlers’ test.

Social Environment

Respondents said that having managers and coworkers who practiced proper handwashing and paid attention to the handwashing practice of others promoted handwashing. Workers identified several situations where managers’ promoted handwashing including: “manager observes handwashing when you return from the bathroom”, “goals and expectations are explained, including handwashing”, “manager paid for cost of food handlers’ cards”, “strict rules are in place about handwashing”, and “manager educates new employees on when handwashing is necessary.” Workers said managers who promoted handwashing usually had a type of “coaching” style. Situations where coworkers promoted handwashing were also identified. These included: (1) coworkers giving guidance to another coworker about when to wash and when not to wash ones hands; (2) having the “best” food worker train all new employees so they develop the correct handwashing practices; and, (3) keeping an eye on someone who is new to make sure they develop good handwashing habits.

Participants from both focus groups said that customers played an important role in their handwashing practice. Participants said they were aware of customers

watching them to see if they washed their hands and this made them more aware of handwashing. However, participants also said they were aware when customers didn't notice if they washed their hands (e.g., "I notice that people don't even care. Every once in a while somebody will say, 'Oh, did you wash your hands?' And I'll be able to turn around and say, yes I did. But very rarely do you have anybody say, did you wash your hands?")

Development of Good Handwashing Habits

Participants felt that practicing good handwashing habits daily made it easier for them to remember to wash their hands. One worker described the process of developing good habits as follows: (e.g., "I would say that one thing is that as I go through my day, its awareness. It's almost like you have different eyes when you enter the restaurant. You have to be conscientiously aware of where your hands are going, what they're doing.") Participants also said bad habits were hard to break. Habits such as "wiping your nose" and "rubbing hands on your apron" were identified. Workers said it was important for new food workers to develop good handwashing habits early in their careers.

Personal beliefs and attitudes

Participants in both focus groups identified various personal beliefs and attitudes as positive influences on handwashing. These included: concern for customers' health, concern for personal health, personal choices made, and taking pride in providing a quality product. One worker said that concern for customers' health was a primary motivating factor in handwashing practice (e.g., "I don't want people to get sick. I work with children"). Several workers said concern for their own health caused them to handwash. They identified going to the bathroom, handling chicken, and the transfer of germs as primary personal health issues. Other respondents said choices made by individual workers was a factor in handwashing practice (e.g., "It comes down to the consciousness of the guy who knew that he just took out a chicken breast and put it on the grill and then went over and made a salad.

He knew that, he didn't care"). Workers also said that when they took pride in their work they were more likely to handwash.

Research Question 3 Summary

Results from focus group question 3 indicate that both external factors of the physical and social environment and food workers' personal internal factors can have a positive influence on handwashing in restaurants. Environmental factors included: sink location and availability, having a sink designated for handwashing, size of kitchen, general cleanliness of sinks and kitchen environment, and having posters and signs to remind them to handwash.

Social environment factors included the positive influence of having an involved and proactive health department and food inspector, and having managers and coworkers who practiced proper handwashing. Participants identified several traits of an effective health inspector. Several situations where managers and coworkers promoted handwashing were also mentioned.

Participants shared several internal personal factors that had a positive effect on handwashing. These factors included: development of good handwashing habits and personal beliefs and attitudes. Participants felt that practicing good handwashing habits daily made it easier for them to remember to wash their hands. Workers said it was important for new food workers to develop good handwashing habits early in their careers. Various personal beliefs and attitudes were noted as having a positive influence on handwashing. These included: concern for customers' health, concern for personal health, personal choices made, and taking pride in providing a quality product.

Finally, quality of education and training was identified as a factor that could be improved to promote handwashing. It was suggested that food workers should receive more education about foodborne illness. Participants felt that workers would be more likely to handwash if they understood what could happen if they didn't wash

their hands. Having the option of taking an in-depth class such as Servsafe was also mentioned.

Survey Analysis

The results of the handwashing survey analysis are presented in the following section. First, demographic characteristics (gender, age, ethnicity, years working in restaurants, educational level, and ownership and type of restaurant) of the study sample are presented. This is followed by a comparative description of the distribution of scores for the survey variables. The next section presents the results of correlation between the survey variables.

Characteristics of Survey Sample

Thirty one adults completed the survey. This represents a 10% response rate. 75 restaurants were contacted in Benton County and 10 restaurants agreed to participate. From the Benton County restaurants, 15 food workers filled out surveys. 232 restaurants were contacted in Multnomah County and 12 restaurants agreed to participate. From the Multnomah County restaurants, 16 food workers filled out surveys. Table 1 displays the gender, age, ethnicity and average duration of time working in restaurants of participants.

Table 1
Demographic Characteristics of Survey Sample

		Responses N= 31	
		<i>n</i>	%
<hr/>			
Gender			
	Female	13	41.9
	Male	18	58.1
	Total	31	100
Age			
	18-29 years	13	41.9
	30-49 years	13	41.9
	50-59 years	1	3.2
	60 + years	4	12.9
	Total	31	100
Ethnicity			
	Asian or Pacific Islander	1	3.2
	Hispanic	5	16.1
	Caucasian	25	80.6
	Total	31	100
Years Working in Restaurants			
	1-5 years	8	25.8
	6-10 years	9	29.0
	11 or more years	14	45.2
	Total	31	100
<hr/>			

A slightly higher proportion of the participants were males (58.1%). The ages of participants ranged from 21-72 years. The mean age of the participants was 36.5 years. Thirteen respondents (41.9%) were between 18-29 years of age, 13 (41.9%) were in the 30-49 years age group, 1 participant (3.2%) was in the 50-59 year category, and 4 participants (12.9%) were 60 years and above. The average number of years working in restaurants was 6-10 years. Eight respondents (25.8%) reported having worked in restaurants for 1-5 years, 9 (29.0%) for 6-10 years, and 14 (45.2%) for 11 or more years. The majority (74.2%) of participants had been employed for six years or longer in restaurants.

As shown on Table 2, the educational status of participants varied from some high school to a bachelors degree. Three participants (9.7%) had some high school and 6 respondents (19.4%) had graduated from high school or received their GED. The remainder of the participants had gone to college with 15 (48.4%) having some college, 2 participants (6.5%) with an associates degree or trade school, and 5 participants (6.1%) had completed a bachelors degree.

Table 2
Educational Attainment of Handwashing Survey Participants

	Responses N= 31	
	<i>n</i>	%
Educational Status		
Some High School	3	9.7%
High School Grad/GED	6	19.4%
Some College	15	48.4%
Associate Degree/Trade	2	6.5%
Bachelors Degree	5	6.1%

Table 3 shows the ownership and types of restaurants where food workers were surveyed. Restaurants could be identified as more than one type. Overall, food workers identified ownership of most restaurants as independently owned; 29 (48.4%). Four (12.9%) of the restaurants were regional chains and one restaurant (3.2%) was identified as a national chain. Two participants (6.5%) were unsure of the type of ownership of their restaurants.

Table 3
Ownership and Type of Restaurant

	Responses N= 31	
	<i>n</i>	%
Ownership of Restaurant		
Regional Chain	4	12.9%
National Chain	1	3.2%
Independently-owned	29	48.4%
Unsure	2	6.5%
Type of Restaurant		
Family Establishment	29	93.5%
Fine Dining Establishment	6	19.4%
Fast Food Restaurant	1	3.2%
Ethnic Restaurant	3	9.7%
Other	7	22.6%

Results of Each Theory of Planned Behavior Variable

Research Question 4

The fourth research question sought to determine food workers' beliefs about outcomes, attitudes, subjective norms, intentions, perceived control, and self-reported behavior regarding handwashing based on the application of the Theory of Planned Behavior (Ajzen, 1986).

Beliefs about outcomes

This section of the survey was divided into two parts. First, participants were asked to indicate their opinion about items that addressed what might happen if they washed their hands regularly at work. Participants were then asked to indicate how important a set of statements about handwashing were to them. The sum of the item scores were added together and then were divided by the number of items answered by participants to determine the mean score for beliefs about outcomes of handwashing (See Appendix J). 12 items were designed to measure the participants' beliefs about the outcomes of handwashing. This set of questions (Q4a- Q5f) focused on food workers' cognitive assessment of handwashing. Responses for Q4a-Q4f were measured on a five point Likert scale with 1 assigned to "I strongly disagree" and 5 assigned to "I strongly agree." Responses for Q5a-Q5f were measured on a five point Likert scale with 1 assigned to "not very important to me" and 5 assigned to "very important to me." Food workers were asked to indicate the importance of each possible outcome. Each item was measured on a five point Likert scale from "not very important to me" to "very important to me."

For the 31 participants the mean score for beliefs about outcomes was 4.27, with a standard deviation (SD) of .27. Cronbach's alpha was not computed for these items because they measured a variety of outcomes regarding handwashing. These outcomes were as follows: complete assigned duties, protect customers, be a responsible food worker, influence handwashing of coworkers, meet customer

expectations, and protect self from getting sick. The beliefs about outcomes item with the highest mean score was “I will be seen as a responsible food worker” ($M = 4.84$, $SD = 0.37$). The lowest mean score for beliefs about outcomes was “If I regularly wash my hands at work, other food workers will” ($M = 4.05$, $SD = 0.82$). See Table 4.

Table 4
Food Worker Handwashing Survey Beliefs About Outcomes (N = 31)

	Mean	Std. Deviation	95% Confidence Interval
Please indicate your opinions and how much you strongly agree or disagree with the following statements:			
Assignments done	4.73	0.46	4.55 – 4.89
Protect customers	4.82	0.48	4.64 – 4.99
Responsible worker	4.84	0.37	4.70 – 4.97
Influence coworkers	4.05	0.82	3.74 – 4.34
What customers want	4.71	0.42	4.55 – 4.86
Protect self	4.80	0.44	4.62 – 4.95
Mean/ SD of Item Means	4.27	0.27	

Attitude

Five items were designed to measure the participants' attitudes about handwashing. This set of questions (Q7a-Q7d) focused on food workers' emotional assessment of handwashing. Responses were measured on a five point Likert scale. The following is an example of an attitude item: "To me handwashing at the right time is "1 assigned to frustrating" to "5 assigned to not frustrating." For the attitude section of the handwashing survey, the overall mean score for for the 31 participants was 4.35, (SD= 0.97). "To me handwashing at the right time is necessary.....not necessary" was the item with the highest mean score; (M = 4.74, SD = 0.999). The lowest ranked item for attitude was "To me handwashing at the right time is convenient.....not convenient"; (M = 4.06, SD = 1.21). Using Cronbach's alpha, reliability for attitude measurement was 0.81. See Table 5.

Table 5
Food Worker Handwashing Survey Attitudes (N = 31)

	Mean	Std. Deviation	95% Confidence Interval
To me handwashing at the right time is:			
Convenient/Not Convenient	4.06	1.21	3.62 – 4.50
Frustrating/Not Frustrating	4.13	1.43	3.60 – 4.65
Practical/ Not Practical	4.45	1.15	4.02 – 4.87
Necessary/Not Necessary	4.74	0.99	4.37 – 5.10
Mean/ SD of Item Means	4.35	0.97	

Subjective Norm

This part of the survey (Q6a-Q6b) asked participants to indicate their level of agreement or disagreement with the following two statements: “My coworkers want me to wash my hands when I am supposed to” and “My manager wants me to wash my hands when I am supposed to.” The purpose of the questions was to represent how food workers perceived the handwashing support they received at their restaurant. A five point Likert scale from 1 assigned to “I strongly disagree” to 5 assigned to “I strongly agree” was used on the response scale. The overall mean score was 4.66 (SD= 0.523). The highest ranked item for subjective norm was “My manager wants me to wash my hands when I am supposed to” (M = 4.90, SD = 0.396). The lowest ranked item was “My coworkers want me to wash my hands when I am supposed to” (M = 4.42, SD = 0.807). Cronbach’s alpha for subjective norm was 0.50. See Table 6.

Table 6
Food Worker Handwashing Survey Subjective Norms (N = 31)

	Mean	Std. Deviation	95% Confidence Interval
Indicate your level of agreement or disagreement with each of the following statements:			
My coworkers want me to handwash	4.42	0.81	4.12 – 4.71
My manager wants me to handwash	4.90	0.39	4.75 – 5.04
Mean/ SD of Item Means	4.66	0.52	

Intention

Three items were designed to measure the participants' plan to handwash in a variety of situations. This set of questions (Q9a-Q9c) were measured on a five point Likert scale from 1 assigned to "very likely" to 5 assigned to "very unlikely." The following is an example of an intention item: Mean score for intention was 4.30 (SD= 0.85). The highest intention item score from the three situations presented was "I intend to wash my hands in every situation I need to" (M = 4.52, SD = 1.21). The lowest intention item score was "During a busy time at the restaurant, I intend to wash my hands" (M = 4.13, SD = 1.34). Cronbach's alpha for intention was 0.49. See Table 7.

Table 7
Food Worker Handwashing Survey Intentions (N = 31)

	Mean	Std. Deviation	95% Confidence Interval
Please indicate how well the following statements match your handwashing intentions:			
I intend to wash my hands in every situation I need to	4.52	1.21	4.07 – 4.95
I intend to wash my hands when I believe I can do so conveniently	4.13	1.34	3.63 – 4.61
I intend to wash my hands during a busy time at the restaurant	4.26	1.06	3.86 – 4.64
Mean/ SD of Item Means	4.52	1.21	

Perceived Control

This part of the survey (Q8b) measured the degree to which food workers believed they could implement their intended handwashing practices. 1 item was used to measure perceived control. Respondents were asked to indicate their level of agreement or disagreement with the following statement: “I can easily find a way to regularly wash my hands at work.” Responses were measured on a five point scale from 1 assigned to “I strongly disagree” to 5 assigned to “I strongly agree.” Perceived Control was measured by a single item. The mean score was 4.90 (SD= 0.39). See Table 8.

Table 8

Food Worker Handwashing Survey Perceived Control (N = 31)

	Mean	Std. Deviation	95% Confidence Interval
Indicate your level of agreement or disagreement with the following statement:			
I can easily find a way to wash my hands at work	4.90	0.39	4.75- 5.00

Self-Reported Handwashing Behavior

One item was included to measure food workers' self-reported handwashing behavior. Participants were asked to indicate their level of agreement or disagreement with the following statement: "I always regularly wash my hands at work." Responses were measured on a five point scale from 1 assigned to "I strongly disagree" to 5 assigned to "I strongly agree." Self-reported handwashing behavior was measured by a single item. The mean score was 4.77 (SD= 0.497). See Table 9.

Table 9

Food Worker Handwashing Survey Self-Reported Handwashing Behavior (N = 31)

	Mean	Std. Deviation	95% Confidence Interval
<hr/>			
Indicate your level of agreement or disagreement with the following statement:			
I always regularly wash my hands at work	4.77	0.50	4.59 – 4.95

Research Question 5

The fifth research question sought to examine the relationship between food worker beliefs about outcomes, attitudes, subjective norms, intentions, perceived control, and behaviors regarding handwashing. Pearson correlations were calculated between each pair of TPB variables. Correlations were computed using SPSS. Statistically significant relationships between the correlations were examined at the $p < .05$ level. Table 8 presents the bivariate correlation analysis of the relationships between the variables. The belief variable and barrier variable of time did not significantly correlate with any variable. All the other variables including attitude, behavior, perceived control, intentions, and barrier (sink) variables showed significant correlations with at least one other variable.

The attitude variable showed a positive significant relationship with perceived control ($r = .526, p < .05$). Subjective norms showed a significant correlation with both behavior ($r = .594, p < .05$), and intentions ($r = .513, p < .05$). Finally, the barrier (sink) variable showed a positive correlation with both perceived behavioral control ($r = .479, p < .05$), and subjective norms ($r = .421, p < .01$).

Table 10
Correlations among the Handwashing Survey Variables

	Beliefs	Attitude	Behavior	Control	Intentions	Norms	Time	Sink
Beliefs	1.00							
Attitude	-.012	1.00						
Behavior	.042	.169	1.00					
Control	.206	.526**	.055	1.00				
Intent	.044	-.159	.245	-.043	1.00			
Norms	.269	.001	.594**	.078	.513**	1.00		
Time (Barrier)	.104	.095	.197	.226	.059	.051	1.00	
Sink (Barrier)	.237	.321	.295	.479**	.162	.421*	-.003	1.00

*Significant correlation at $p < .01$

**Significant correlation at $p < .05$

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to identify the knowledge, attitudes, practices and barriers related to handwashing in the restaurant environment and to determine food workers beliefs about outcomes, attitudes, subjective norms, intentions, perceived control and behaviors regarding handwashing. This chapter provides a discussion of the results, conclusions and recommendations based on the findings of the study presented in Chapter Four. The chapter is organized in four sections. The first two sections discuss results of the focus groups and handwashing survey. The last two sections present the conclusions and recommendations.

Focus Group Discussion

Food workers Knowledge of Handwashing Practice

For the most part, food workers in this study reported having extensive knowledge about correct handwashing practice. They identified several scenarios describing when handwashing was needed. Despite this knowledge, many participants reported various situations when handwashing practice was not implemented. These situations existed because of a multiple number of barriers that hindered practicing correct handwashing at the appropriate times. These findings support earlier research suggesting that food workers are knowledgeable of the food safety actions they should be carrying out but identify a number of barriers which prevent them from implementing these practices (Clayton et al. 1994).

Handwashing Barriers that Exist for Food Workers

The barriers identified by participants in the current study are also comparable to many of the barriers recognized by health care and food workers from previous studies. Handwashing barriers reported by health care workers include: inaccessible supplies, insufficient time, high workload and understaffing, and insufficient scientific

information showing how improved handwashing reduces infection rate (Conly et. al, 1989; Donowitz, 1997; Kretzer and Larson, 1998; Larson and Killien, 1982; Larson and Kretzer, 1995; Pittet et. al., 1999). Handwashing barriers have also been identified in various studies examining food workers' barriers to handwashing. In a handwashing study by Howes (1996), lack of supervisory and/or peer support, and lack of provision of proper equipment (sinks hot water, and soap) were factors in preventing adequate handwashing. Busy work schedules and handwashing facilities too far from work area are other barriers that have been noted (Witten, 2001).

Similarly, participants of the focus group described barriers of the physical environment such as not having towels, soap or hot water when needed. Having a sink inconveniently located or inaccessible was also identified as a handwashing barrier. Stress and time pressure due to a heavy workload and understaffing were mentioned by all participants as factors that negatively affected all food workers, regardless of how conscientious they were about handwashing.

Although physical environment barriers were recognized, many of the barriers identified by participants were related to the social environment. The absence of handwashing support from managers and coworkers was identified as a barrier that negatively impacted practice. Participants said they were less likely to handwash if they did not feel supported in their practice. A past health care study assessing the presence of medical staff role models on handwashing practice supports these findings. The study found that health care workers were much less likely to perform hand hygiene if a peer or higher ranking person in the room did not perform handwashing (Lankford, 2003).

Organizational structure of the restaurant also affects handwashing. For example, some participants felt that working for a corporate chain rather than a family restaurant had an impact on handwashing practice. However no specific theme developed as to if either type of restaurant was more or less effective at encouraging handwashing. The major point was that in general, restaurants that promoted a "close connection" environment encouraged handwashing because the employees cared

about the organization and wanted to contribute to its success. Dubbert et. al (1990) determined similar conclusions in their study of health care environment influences on handwashing. The priority of the health care institution places on handwashing and an institutional climate that encourages safe practices were identified as important components to an organization where workers successfully implemented handwashing practice.

Positive Influences that Promote Food Workers Handwashing

In contrast to the barriers to handwashing, food workers also identified factors that positively affected handwashing. Similar to the barriers, positive factors related to the physical and social environment. Internal factors relating to personal choices made by food workers were also identified as having a positive influence. Participants said handwashing occurred more frequently in kitchens with sinks in close proximity of the work area. Cleanliness of kitchen and sink area, and visual reminders such as posters and signs were also noted as physical factors that encouraged handwashing.

Social environment also played an important role in handwashing practice. The importance of an encouraging social environment promoted by managers and coworkers that support handwashing was addressed multiple times by participants. It was recognized that managers who spent frequent time in the kitchen and gave praise to food workers implementing handwashing had a positive impact. Participants outlined several ways managers can successfully promote handwashing. These included: explaining goals and expectations, paying for training such as the food handlers' card, strict rules in place about handwashing, and educating new workers about handwashing. It was also noted that customers could positively influence handwashing by taking notice and commenting when food workers wash their hands.

Food workers also described internal factors that positively affected handwashing. Development of good handwashing habits and personal beliefs and attitudes were identified as attributes that conscientious food workers possessed. One participant described a type of "awareness" that served as a reminder to handwash

throughout the day. Several workers also said concern for their own health reminded them to wash their hands. Others mentioned the importance of taking pride in providing the customer with a quality product.

Overall, handwashing education and training was the most frequently identified factor that influenced handwashing. Food workers described education and training in the contexts of both discouraging and encouraging handwashing. Several participants from both focus groups said that the current food handler card was not effective in developing handwashing practice. Participants also noted that handwashing training in restaurants was not given a high priority. Because of the complexity of tasks in the restaurant environment, handwashing education was not considered an important component of new worker orientation and training.

In regards to food workers dissatisfaction with current training methods, it has been proposed that training of food workers is more likely to be successful if factors such as management support, employee motivations and environmental constraints are considered (Ehiri and Morris, 1994). It has been suggested that disparity between knowledge and practice occurs because much of the existing training is designed using the Knowledge, Attitude and Practice (KAP) model (Clayton et al, 2002). This approach assumes that an individual's behavior or practice is dependent on their knowledge and that provided information will result in a change in attitude or behavior.

Workers identified several areas where education and training could be improved to promote handwashing. Workers from both focus groups said they would like to know more about what foodborne illnesses are caused by workers not washing their hands during food preparation. Food workers also requested training that was more hands-on, applying techniques that are actually used in restaurants. Health departments and inspectors were also identified as playing an important educational role in handwashing practice.

Focus group participants' ideas for improving education and training are similar to recommendations made by several researchers. Howes (1996) has suggested

that food safety education and training should be taught in restaurants as a whole learning unit rather than to individual food workers. This way, managers can become familiar with the education and training program and adjust restaurant handwashing policies as needed to support the training program in practice.

The results of the focus group suggest that a full range of factors exist that impact handwashing behavior in restaurant kitchens. During the focus groups, participating food workers provided a candid view of the handwashing barriers existing in restaurant kitchens. In combination with the results of the survey, information shared during the focus groups have implications for improving handwashing training provided to food workers.

Survey Discussion

The survey presented a method for measuring individual beliefs, attitudes and barriers about handwashing. An analysis of the measured variables provided a way to identify the importance food workers placed on factors affecting handwashing. For example, the two survey items with the highest mean scores were related to manager support and being viewed as a responsible food worker. The two survey items with the lowest mean scores were related to having an influence on coworkers and convenience of handwashing. A limitation of the study was the very low survey response rate. The 31 respondents represents only 10% of the 307 restaurants who were invited to participate in the study. Recruitment was difficult in that many restaurants contacted were not interested in participating in the survey. Reasons included, not enough time to complete a survey and not enough staff members to have a food worker take time to fill out a survey. Food workers were also very reluctant to participate in both the focus group and surveys. Participants of the focus groups mentioned concern that information shared during the discussions might be shared with their managers. For the most part, focus group participants and survey respondents reported feeling comfortable when they realized all information was confidential and they would not be asked to identify their names, personal information. However one focus group

participant did not feel comfortable speaking until after the focus group, they stayed afterwards to share about handwashing in their kitchen with the researchers.

Food workers ranked all measures with relatively high importance. The range of means for all items from lowest to highest was 4.06 – 4.90. This shows that respondents identified all components of the survey as having an influence on handwashing practice. However, the highly scored mean scores for the survey variables may be the result of a “ceiling effect” which means that the Likert-type scale may have made it easy for many food workers to agree with positive statements about the importance of handwashing and overestimate handwashing behaviors and intentions (Cronbach & Meehl, 1955).. These findings are similar to results of a Theory of Planned Behavior handwashing study by O’Boyle et al. (2002) who concluded that health care workers overestimated their self-reported handwashing behaviors and intentions.

Beliefs About Outcomes

Survey participants’ on the whole strongly agreed with beliefs about outcomes statements and ranked these items with importance on the Likert scale. Almost all participants, (97%) agreed that customers wanted foodworkers to wash their hands. Protecting self from getting sick by washing hands was identified as important and effective by 94% of participants. 91% viewed being seen as a responsible food worker very important and believed if they regularly washed their hands at work they would be seen as responsible. Respondents also placed a high level of importance on protecting customers health. 90% of survey participants agreed that washing their hands to protect customers was important and this would protect restaurant customers from foodborne illness. Participants for the most part (88%) agreed that they could get all of their assignments done if they regularly washed their hands. Influencing coworkers to wash their hands received the lowest percentage of agreement and importance at 59%.

These results show that food workers find handwashing implementation to be very important. Similar findings were identified during the focus groups when participants identified their personal beliefs of wanting to protect customers' health and their own health. Focus group participants also said that being seen as a responsible food worker by customers and managers was important to them. However, there was a difference between focus groups and the survey in regards to coworkers influence on handwashing. The importance of having coworkers support handwashing was mentioned various times during the focus group. However, these results were not borne out in the survey, when participants were asked if their handwashing practice influenced coworkers to wash their hands.

Attitudes

Survey participants expressed the attitude that handwashing was necessary and practical but that it was somewhat frustrating and not convenient. All respondents (100%) said that handwashing was necessary in restaurant kitchens and 77% said that handwashing was practical. However a fair proportion (35%) said that handwashing was not frustrating and only 48% respondents found handwashing to be convenient. These results reflect the points made by focus group participants. Although food workers are aware of the necessity and practical application of handwashing, there are many barriers existing that make handwashing frustrating and inconvenient.

Subjective Norms

Participants' responses to questions regarding the influence they believed managers and coworkers had on their handwashing practice exhibited interesting results. With regard to managers wanting food workers to handwash, 97% either "strongly agreed" or "agreed." A smaller percentage of participants (78%) "strongly agreed" or "agreed" that coworkers wanted other food workers to wash their hands. These findings are similar to results of the focus groups. Participants identified the handwashing influence of both managers and coworkers. However participants in both

the focus groups and survey reported managers as having the greatest ability to influence food workers' handwashing practice.

Intentions

Almost all participants (91%) responded that they intended to wash their hands in every situation necessary. Fewer participants showed intention to wash hands during a busy time at the restaurant (84%). This reflects results of the focus groups showing that food workers perceived lack of time as a significant barrier to handwashing. 77% of survey respondents intended to wash their hands when it could be done so conveniently. These findings are similar to other items on the survey asking participants about convenience of handwashing.

Perceived Control

The majority of survey participants (95%) reported that they could easily find a way to wash their hands at work. Examining the level of perceived control reported by survey respondents compared to identified barriers of focus group and survey participants creates an interesting comparison. Focus group participants described several barriers to handwashing in restaurant kitchens. These barriers included physical barriers, time constraints, and issues involving restaurant type, amount of management involvement and the need for education and training. Although several physical factors were identified, (inadequate supplies, broken equipment; towel and soap dispensers and sinks) most barriers to handwashing related to the social environment. Food workers feel like they have a firm control on internal barriers (attitude, perception, personal beliefs) but do not report they have control over external barriers. Perhaps the high level of perceived control reported by survey respondents is related to the fact that most identified barriers are external factors, so although food workers feel like they can easily wash their hands, they are not always aware of the existing external barriers.

Self-Reported Handwashing Behavior

Most survey participants (97%) also reported that they always regularly washed their hands at work. This finding did not match the responses of focus group participants who identified numerous occasions when handwashing was not implemented. It is important to note that previous research has found that food workers report engaging in safe practices more frequently than they actually implement those practices (Clayton et al., 2002). This is likely because of the tendency for people to over-report the level in which they engage in socially desirable behaviors.

Correlations Between Handwashing Survey Variables

Figure 2 is a graphic representation of the variables and their relationships which were translated using Pearson correlations. The correlations between variables indicate similar results when compared to findings of the focus groups. Subjective norm was found to have a significant correlation with behavior ($r = .594$, $p < .05$). Subjective norm variables addressed handwashing support provided by coworkers and managers. During the focus groups, social environment was a primary item mentioned as having both a negative and positive effect on handwashing, depending on support provided. Results from the survey showed that subjective norms (social environment) directly correlated with handwashing behavior. Snyder (1998) also reported that managers can positively influence handwashing by regularly complimenting employees for using correct handwashing procedures, provide clean, well-maintained handwashing facilities in kitchen and restroom areas, and share customer and health department compliments with employees.

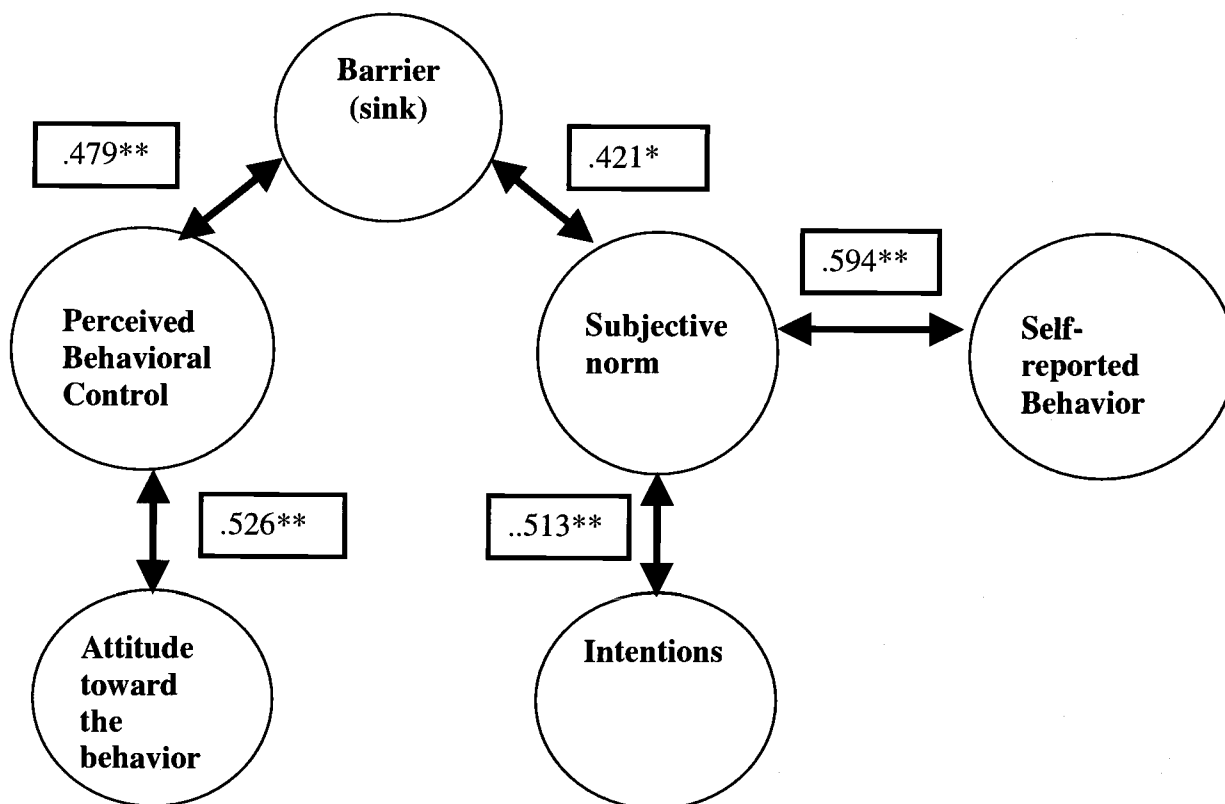
Subjective norm also correlated with intentions. This indicates that social environment (support from managers and coworkers) plays a role in food workers forming intentions which lead to handwashing behavior. Although this study did not use a predictive model, this finding was different than noted by Jenner et al. (2002). Their survey found neither subjective norms nor perceived behavioral control significantly predicted intentions. This indicates that although many similarities exist

between food workers' and health care workers' handwashing practice, there are differences in factors affecting handwashing intention. Internal barriers such as attitudes and personal responsibility were significant predictors of handwashing intention for health care workers, whereas external barriers such as manager and coworker support showed a significant correlation with intention.

The item statement "having a sink near my work area makes handwashing easier" significantly correlated with both perceived behavioral control and subjective norms. Participants from the focus groups also said handwashing occurred more frequently in kitchen with sinks in close proximity of work area. The results of the survey item measuring importance of sink location shows that physical environment factors play an important role in the amount of control food workers feel they have in regards to their ability to implement handwashing practice. And finally, the attitude variable showed a positive significant relationship with perceived control. This indicates that food workers who have a positive attitude towards handwashing are more likely to feel that they have control in their ability to implement handwashing practice.

The findings show that both internal and external factors influence food workers ability to implement handwashing practice. This suggests that in order for handwashing interventions to be successful, a full range of factors must be addressed. Such activities could improve the effectiveness of handwashing training programs.

Figure 2
Correlations of Food Worker Handwashing Survey Variables



Conclusions

This study investigated the handwashing attitudes, intentions, behaviors and barriers of food workers in the restaurant environment. The following conclusions are based on qualitative and quantitative results of both the focus groups and survey. The research showed that focus group participants and survey respondents identified many similar factors that influenced handwashing practice. The following list presents the major conclusions of the study:

Although participants knew correct handwashing practice and when to wash hands, several barriers that hindered handwashing were identified. Barriers identified as most important were time pressure, lack of accountability, lack of involvement of managers and coworkers, and an organization that is not supportive of handwashing.

Time pressure due to high volume of business was mentioned as having a serious impact on handwashing. Respondents identified time pressure as a factor that negatively affected all food workers, regardless of how conscientious they were about handwashing. Participants also said lack of accountability was an issue in their kitchens. Participants felt accountability had to be instilled by managers, by peers and by support provided at the organizational level.

Workers from both focus groups felt they did not receive adequate handwashing training at their restaurants. Workers said their employees did not take training seriously and it was assumed that new trainees should already know about handwashing. Respondents from both focus groups said the current food handler card training was not effective in teaching handwashing practice to food workers.

Workers identified several areas where education and training could be improved to promote handwashing. These areas included an explanation of types of foodborne illness and symptoms and having the option of receiving more hands-on training.

Participants identified factors that positively influenced handwashing. Positive design and environmental factors were: sink location and availability, having a sink designated for handwashing, size of kitchen, general cleanliness of sinks and kitchen environment, and having posters and signs reminding food workers of handwashing.

Results from the survey in measuring beliefs about the outcomes of handwashing showed that food workers identified handwashing as important in being seen as a responsible food worker and also with the belief of protecting self from getting sick. For the section of the survey measuring attitudes, participants were in strong agreement that handwashing is necessary and practical.

For the variables measuring subjective norms, food workers strongly agreed that managers and coworkers wanted them to wash their hands when they were supposed to. Most participants had an intention of washing hands in every situation needed. However participants said they had less intention of washing their hands when they could do so conveniently or during a busy time in the restaurant. Also, food workers measured their self-reported handwashing behavior as high.

Several handwashing variables correlated with one another. The attitude variable showed a positive significant relationship with perceived control; subjective norms showed a significant correlation with both behavior and intentions; and, the barrier (sink) variable showed a positive correlation with both intentions and subjective norms.

Recommendations

The potential risks of foodborne illness warrants continued exploration of innovative ways to improve handwashing education, training and interventions in the restaurant environment. From the perspective of the food workers, current knowledge-based handwashing training programs do not address the internal and external barriers that affect handwashing practice. Because a safe restaurant environment involves appropriate handwashing by all food workers, additional research should focus on how to train managers and workers to recognize handwashing barriers in their individual restaurants and work to make organizational changes to minimize or eliminate these barriers.

Interventions should be created to address the various factors leading to adherence of handwashing practice. These factors include components of both the physical and social environment. Because barriers to handwashing are multi-dimensional in nature, factors must be considered to be connected, and identified through a systematic approach that seeks to improve handwashing intervention through wholistic approaches. In both the focus groups and handwashing surveys, food workers identified multiple factors which influence their handwashing practice.

A program which addresses factors identified by focus group and handwashing survey participants would include the following physical and social environment components: a hands-on training program to orient new employees to correct handwashing practice, involvement of both managers and coworkers in new employee handwashing training, emphasis on providing an attractive and clean sink for handwashing with necessary supplies (soap, warm water, and paper towels) provided, continued handwashing training and support involving managers and coworkers, and involvement of health departments and inspectors in providing managers and food workers with advice and consultation regarding improvement of handwashing practice.

Food programs at the county and state level can assist restaurants in identifying handwashing barriers and implementing interventions in a variety of ways. The difficulty in recruiting food workers for both the focus group and surveys indicate that handwashing remains a sensitive issue in restaurants. Because an open dialogue is necessary in developing new ways of promoting handwashing, food programs can serve as the leader in providing a forum where food workers and managers feel comfortable discussing handwashing. Food safety specialists should seek the advice of both food workers and managers when designing and incorporating new policies or education and training. This would provide food programs with a greater understanding of the educational and training needs of food workers.

Food safety specialists should also provide training at the restaurants so barriers to handwashing can be addressed through a method of problem solving involving managers and food workers in the workplace. This would also create an environment where individuals from the food service industry are provided with applied knowledge for implementing handwashing in the restaurant environment. It is important to note that collaboration with health departments and restaurants is important. If restaurant owners were willing to pay food workers' wages for health department education and training received at the restaurant, this would demonstrate to employees the importance placed on handwashing by managerial staff.

The involvement of food industry leaders at an organizational level is crucial for improving handwashing practice in restaurants. In order to narrow the disconnect between external support and outcomes, food programs should use a business model to communicate the importance of handwashing interventions to restaurants. Owners and managers understand the concept of business continuity and how a foodborne illness incidence could have serious implications to the success of their establishment. Developing a business model message would encourage restaurants to emphasize the importance of handwashing at an organizational level.

Results of the study also identified various internal factors emphasized by study participants. Handwashing interventions could prove effective if developed based on areas food workers identified as important. Concern for customers' health, concern for personal health, personal choices made, and taking pride in providing a quality product were all internal factors seen as having an impact on handwashing practice. By developing an understanding of how these factors could be incorporated into handwashing training, behavioral interventions could be developed to encourage handwashing.

Results from this study show that future research is needed regarding the practices of handwashing in restaurant kitchens. Focus group participants identified the importance of teaching new employees correct handwashing practice to assist them in developing good handwashing habits early in their career. Participants also shared that handwashing lessons learned at an early age provided them with a conscientious awareness of the need to handwash during food preparation. Because many individuals begin employment as food workers during their teenage years, future research should involve teens in focus group discussions about effective ways to promote handwashing education, training and interventions. This would provide valuable information on how to encourage beginning foodservice employees to develop correct handwashing habits early in their career. Future studies should also be done to conduct handwashing focus groups with different ethnic groups to identify the

unique education, training and intervention needs of individuals who speak English as a second language.

Finally, measures should be taken to involve food workers, restaurant owners, kitchen managers, health departments, and inspectors in a dialogue to continue discussion of ways to improve handwashing interventions. This research demonstrates the effectiveness of research which seeks to include the experience and knowledge of food workers currently working in the restaurant environment. This study showed that the qualitative approach of group dialogue provided richer and more detailed data than the quantitative approach of surveys. Information provided through the focus group discussions proved to be more insightful and provided a rare opportunity to learn more about the perceived barriers to handwashing of food workers. Future studies with food workers should continue to utilize focus groups. Survey research proved to be more difficult with recruitment and did not provide a forum for food workers to openly discuss their concerns and suggestions. Feedback provided by focus group participants proved to be valuable in identifying barriers to handwashing that are rarely considered in the development of education and training programs. Continued research with involvement from food workers should improve the effectiveness of these programs as well as contribute to a broader understanding of effective handwashing strategies.

Bibliography

- Ajzen, I. (1998) . Attitudes, personality and behavior. Chicago, IL: The Dorsey Press.
- Aday, L. A. (1996). Designing and conducting health surveys: A comprehensive guide. San Fransisco, CA: Jossey-Bass Publishers
- Bischoff, W. E. , Reynolds, T. M. , Sessler, C. N. , Edmond, M. B. , & Wenzel, R. P. (2000) . Handwashing compliance by health care workers, the impact of introducing an accessible, alcohol-based antiseptic. Archives of Internal Medicine, 160, 1017-1021.
- Boyce, J. M., & Pittet, D. (2002) . Guideline for hand hygiene in health-care settings: recommendations of the healthcare infection control practices advisory committee and the HIPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. American Journal of Infection Control, 30,
- Bryan, F. (1998) . Risks of practices, procedures and practices that lead to outbreaks of foodborne diseases. Journal of Food Protection, 51, 663-673.
- Cabana, M. D. , Rand, C. S. , & Powe, N. R. (1999) . Why don't physicians follow clinical practice guidelines?: a framework for improvement. Journal of the American Medical Association, 282, 1458-1456.
- Chioncel, N. E. , Van Der Veen, R. G. W. , Wildemeersch, D . , & Jarvis, P . (2003). The validity and reliability of focus groups as a research method in adult education. International Journal of Lifelong Education, 22, 495-517.
- Clayton, D., Griffith, C., Price, P., & Peters, A. (2002). Food handlers' beliefs and self-reported practices. International Journal of Environmental Health Research, 12, 25-39.

- Clingman, C . D . (1976) . Ohio evaluates effects of food certification training. Journal of Environmental Health, 38, 235-236.
- Collins, J. (1997) . Impact of changing consumer lifestyles on the emergence/reemergence of foodborne pathogens. Emerging Infectious Diseases, 3, 471-480.
- Crisley, F. D. , and Foster, M. J. (1965) . The use of antimicrobial soaps and detergents for hand washing in food service establishments. Journal of Milk, Food Technology, 28, 278-284.
- Crowther, J . , Herd, T . , & Michels, M . (1993) . Food safety education and awareness: a model training program for managers. Food Control, 4.
- Davey, G . R . (1985) . Food poisoning in New South Wales, 1977-84. Food Technology in Australia, 37, 453-457.
- DeWaal Smith, C. , & Dahl, E. (1996) . The Failure of local agencies to adopt and enforce national food safety standards for restaurants. Center for Science in the Public Interest.
- Dippold, L. , Lee, R. , Selman, C. , Monroe, S. , & Henry, C. (2003) . A gastroenteritis outbreak due to norovirus associated with a Colorado hotel . Journal of Environmental Health, 66, 13-17.
- Dubbert, P. M. , Dolce, J. , Richter, W. , Miller, M. , & Chapman, S. (1990) . Increasing ICU staff handwashing: effects of education and group feedback. Infection Control Hospital Epidemiology, 11, 191-193.

Ehiri, J., & Morris, G. (1994). Food safety control strategies: A critical review of traditional approaches. International Journal of Environmental Health Research, 4, 254-263.

Ehiri, J. E. , Morris, G. P. , & McEwen, J. (1997) . Evaluation of a food hygiene training course in Scotland. Food Control, 8, 137-147.

Ehiri, J. E. , & Morris, G. P. (1996) . Hygiene training and education of food handlers: does it work? Ecology of Food and Nutrition, 35, 339-343.

Emory, H. C. (1990) . Changing poor handwashing habits- a continuing challenge for sanitarians. Dairy, Food and Environmental Sanitation, 10, 8-9.

Fendler, E. J. , Dolan, M. J. , & Williams, R. A. (1998) . Handwashing and gloving for food protection part I: Examination of the evidence. Dairy, Food and Environmental Sanitation, 18, 814-823.

Fuller, T. D., Edwards, J. N., Vorakitphokatorn, S., & Sermsri, S. (1993). Using focus groups to adapt survey instruments to new populations: experience from a developing country. In D. L. Morgan (Ed.), *Successful focus groups: Advancing the state of the art* (pp. 89-104). Newbury Park, CA: Sage.

Griffith, C. J., Mullan, B.A., & Price, P.E. (1995) . Food safety: implications for food, medical and behavioural scientists. British Food Journal, 97, 36-41.

Hennum, G., Lawrence, D., & Snyder, O. (1983). Two years of mandatory foodborne illness prevention certification training in Moorehead, Minnesota. Dairy, Food and Environmental Sanitation, 3, 208-214.

Hernandez, J. (2001) . A recipe for food safety training. Restaurant Hospitality, 85, 1.

Hollway, W. , & Jefferson, T. (2000). Doing Qualitative Research Differently.
London: Sage.

Howes, M. , McEwen, S. , Griffiths, M. , & Harris, L. (1996) . Food handler
certification by home study: measuring changes in knowledge and behavior.
Dairy, Food and Environmental Sanitation, 16, 339-343.

Hughes, D., & DuMont, K. (1993). Using focus groups to facilitate culturally
anchored research. American Journal of Community Psychology, 21, 775-805.

Hunter, B. T. (2000) . So, how important is handwashing? Consumers' Research.

Jenner, E.A., Watson, P.W., Miller, L., Jones, F., & Scott, G.M. (2002). Explaining
hand hygiene practice: An extended application of the Theory of Planned
Behavior. Psychology, Health & Medicine, 7, 311-326.

Kaferstein, F.K., Motarjemi, Y., and Bettcher, D.W. (1997) . Foodborne disease
control: A transnational challenge. Emerging Infectious Diseases, 3, 503-511.

Kitzinger, J. (1996) . Introducing focus groups. In N. Mays and C. Pope (eds)
Qualitative research in health care. London, British Medical Journal Publishing
Group.

Kretzer, E. K. , & Larson, E. L. (1998). Behavioral interventions to improve infection
control practices. American Journal of Infection Control, 10, 245-253.

Krueger, R. A., & Casey, M. A. (2000) . Focus groups: A practical guide for applied
research. Thousand Oaks, California. Sage Publications, Inc.

Labarraque, A. G. (1829). Instructions and observations regarding the use of the chlorides of soda and lime. Porter J., ed. [French] New Haven, Ct: Baldwin and Treadway.

Lane, C. (2001) . Now wash your hands. Food Processing, 9.

Larson, E. (2004) . A tool to assess barriers to adherence to hand hygiene guideline. American Journal of Infection Control, 32, 48-51.

Larson, E. , & Kretzer, E. K. (1995) . Compliance with handwashing and barrier precautions. Journal of Hospital Infection, 30, 88-106.

Larson, E. , & Killien, M. (1982) . Factors influencing handwashing behavior of patient care personnel. American Journal of Infection Control, 10, 93-99.

Laurie, H., & Sullivan, O. (1991). Combining qualitative and quantitative data in the longitudinal study of household allocations. Sociological Review, 39, 113-130.

Lynch, R. A. , Elledge, B. L. , Griffith, C. C. , & Boatright, D. T. (2003) . A comparison of food safety knowledge among restaurant managers by source of training and experience, in Oklahoma county, Oklahoma. Journal of Environmental Health, 66, 9-14.

Lynn, J. (1996). Better safe than sorry: training food handlers protects everyone. Restaurants USA.
<http://www.restaurant.org/rusa/magArticle.cfm?ArticleID=182> (15 Mar. 2004).

- Madsen, M. K., Kowalik, J., & Smuckler, N. (2002). Utilizing focus groups to determine barriers to prenatal care adequacy among african american adolescents. Clinical Research and Regulatory Affairs, 19, 4.
- Manning, C . K . , & Snider, S . O . (1993) . Temporary public eating places: food safety knowledge, attitudes and practices. Journal of Environmental Health, 1.
- Marriot, N. (1999) . Principles of Food Sanitation (4th ed.) . Gaithersburg, Maryland: Aspen Publication.
- Marwick, C. (1997). Putting money where the US mouth is: Initiative on food safety gets under way. Journal of the American Medical Association, 21.
- Mead, P . S . , Slutsker, L . , Dietz, V . , McCaig, J . S . , Shapiro, C . , Griffin, P . M . , & Tauxe, R . V . (1999) . Food-related illness and death in the United States. Emerging Infectious Diseases, 5, 5.
- McKeown, M. , & Williamson, D. (1992) . Awareness and practice of HIV and hepatitis B guidelines in a psychiatric hospital. Health Bulletin, 50.
- Michaels, B. (2000) . Focus on personal hygiene through HACCP. International Food Hygiene, 12, 17.
- National Restaurant Association. (1997) . Restaurant Industry Pocket Factbook. Washington, D.C.: The Association.
- O'Boyle, C. A. , Henly, S. J. , & Larson, E. (2001). Understanding adherence to hand hygiene recommendations: the theory of planned behavior. American Journal of Infction Control, 29, 6.

O'Boyle, C. A. (1998). Variables that influence health care workers' adherence to recommended handwashing practices. Doctoral Dissertation, University of Minnesota.

Oregon Department of Human Services (2002) . Environmental Services and Consultation Section. Self-Training Manual. "Food Safety".

Oteri, T . , & Ekanem, E . (1989) . Food hygiene behavior among hospital food handlers. Public Health, 153-159.

Paulson, D. S. (1993) . Variability evaluation of two handwash modalities employed in the food processing industry. Dairy, Food and Environmental Sanitation, 13, 332-335.

Pether, J. V. , and Gilber, R. J. (1971) . The survival of salmonellas on fingertips and transfer of the organisms to food. Journal of Hygiene, 69, 673-681.

Pittet, D. (2001). Improving adherence to hand hygiene practice: a multidisciplinary approach. Emerging Infectious Diseases, 7, 234-240.

Pittet, D ., Mourouga, P. , and Perneger, T. V. (1999) . Compliance with handwashing in a teaching hospital. Annals of Internal Medicine, 130, 126-130.

Rennie, D. M . (1995) . Health education models and food hygiene education. Journal of Research in Social Health, 115. 75-79.

Rennie, D . M . (1994) . Evaluation of food hygiene education. British Food Journal, 96, 20-25.

- Roberts, L. , Bolton, P. , & Asman, S . (1998) . Compliance of hand washing practices: Theory versus practice. Australian Health Review, 21, 238-244.
- Roberts, D . (1982) . Factors contributing to outbreaks of food poisoning in England and Wales, 1970-1979. Journal of Hygiene, 89, 1970-1982.
- Semmelweis, I., (1983) . Etiology, concept, and prophylaxis of childbed fever. Carter, K. C., ed. 1st ed. Madison, WI: The University of Wisconsin Press.
- Sheeran, P. , & Silverman, M . (2003) . Evaluation of three interventions to promote workplace health and safety: evidence for the utility of implementation intentions. Social Science & Medicine, 56, 2153-2163.
- Snyder, P. O. , (1998) . Hand washing for retail food operations- a review. Dairy, Food and Environmental Sanitation, 18, 149-162.
- Sproat, L. J. , & Inghs, T. J. (1994) . A multicentre survey of hand hygiene practice in intensive care units. Journal of Hospital Infection, 26, 137-148.
- Taylor, E.A., & Taylor, J.Z. (2004). Using qualitative psychology to investigate HACCP implementation barriers. International Journal of Environmental Health Research, 14, 53-63.
- Trettin, L., & Musham, C. (2001) . Using focus groups to design a community health program: what roles should volunteers play? Human Resources Abstract, 36, 444-455.
- Watanakunakorn, C. , Wang, C. , & Hazy, J . (1998) . An observational study of handwashing and infection control practices by healthcare workers. Infection Control and Hospital Epidemiology, 19, 858-860.

West, A. (1992) . Educating staff in food hygiene. Journal of the Royal Society of Health, 34-38.

Witten, M. L. (2001). Influence of an incentive program on handwashing practices and handwashing prevalence among university food workers. Thesis. Master of Science. Texas Woman's University, Denton, Texas.

World Health Organization. (1988) . Health Education in Food Safety. WHO/EHE/FOS, 88, 7.

APPENDICES

APPENDIX A: Focus Group Informational Letter to Manager

Dear Sir or Madam:

My name is Aimee Pragle and I am an M.S. candidate in Environmental Health at Oregon State University. I'm working with the Department of Human Services and Oregon State University on a research project focused on handwashing in restaurants. Your restaurant was picked at random from a list of all restaurants in Benton County. Because of this a recruiting call will be made to your restaurant to extending an invitation to a food handling worker to participate in the handwashing focus group study.

The objective of this project is to identify the full range of practices and barriers relating to handwashing in the restaurant environment by conducting focus groups in which small groups of food workers discuss their responses to questions posed by a group facilitator. The issues addressed by focus group participants will assist the Oregon Department of Human Services in developing effective behavioral interventions designed to promote safe food handling practices among restaurant food workers.

Please keep in mind the purpose of this focus group is educational. The discussion and comments of participating food workers will be kept confidential and are in no way connected to your restaurant establishment. Food handling workers will be accepted in the study only if the time does not conflict with their work schedule.

Any questions regarding the study, feel free to contact me at (503) 731-4012 or via e-mail at praglea@onid.orst.edu.

Sincerely,

Aimee Pragle
M.S. Candidate
Oregon State University

APPENDIX B: Focus Group Phone Script

Hello, my name is Aimee Pragle. I'm calling from the Department of Human Services.
May I please speak with someone who works in the kitchen?

(Once person is on the line)

Hello, my name is Aimee Pragle. I'm calling from the Department of Human Services.
We're working with Oregon State University on a research study on hand washing during food preparation in restaurant kitchens. Talking to food workers directly is important to really get a good understanding of the topic. This discussion group will be composed of workers like yourself, but from other restaurants and a group leader. The discussion will last about two hours and will take place at _____.
Let me emphasize we are not trying to sell anything. The purpose of the discussion is to learn more about handwashing from food workers. We will pay the people who are part of the discussion group fifty dollars for their time.

The discussion group is scheduled for _____, are you interested in possibly being a participant?

NO. Thank you for your time (Conclude call)

YES. Good. I need to ask you a few more questions.

1. How old are you?

IF UNDER 18. Unfortunately you do not meet our screening criteria. Thank you for your time. (Conclude call)

If 18 OR OLDER. (Ask Question 2)

2. Are you a kitchen manager?

NO. (Ask Question 3)

YES. Unfortunately you do not meet our screening criteria. Thank you for your time.

(Conclude call)

3. Do you currently work in a restaurant kitchen preparing, cooking, or storing food?

NO. Unfortunately you do not meet our screening criteria. Thank you for your time.

(Conclude call)

YES. (Ask Question 4)

4. What is your job title?

5. How long have you worked in restaurant kitchens preparing, cooking, or storing food?

IF UNDER 3 MONTHS. Unfortunately you do not meet our screening criteria. Thank you for your time. (Conclude call)

If OVER THREE MONTHS. Good. You meet our selection criteria. Now I need to tell you a little more about the study, and get a little more information from you.

As I said earlier, if you agree to participate, you will have a two-hour group discussion with restaurant workers about food handling practices at work. None of the questions you will be asked during the discussion are about private or touchy matters, but it is an open discussion. If any questions make you feel uneasy, you may choose not to respond.

The discussion will be audio-taped and you will use your first name during the discussion. However, your names and your restaurant's names won't be revealed in any reports. And although we will need to get your contact information, that

information will be stored separately from the tapes, and will be destroyed at the end of the study. Thus, there will be no link between the tapes and the names of people who participated, and what you say will be kept private. Also, only people involved in this study will have access to the tapes.

If you would like to get more information about the study or your rights as a participant, I can give you a phone number to call.

Please contact me, Aimee Pragle at (503) 731-4012 to confirm your participation in the study. If I'm not there just leave a message on my answering machine and I will return your call.

Thank you for your time.

(End of call)

APPENDIX C: Focus Group Food Workers Contact Phone Script

(Food Worker calls for more information regarding the focus group)

Thank you for your interest in the handwashing focus group study. I remember speaking to you earlier. Let me introduce myself again. My name is Aimee Pragle and I am a graduate student in Public Health at Oregon State University. I'll also go over the details of the study. The focus group is a collaborative project of the Oregon Department of Human Services and Oregon State University. The purpose of the focus group discussion is to talk about handwashing during food preparation in restaurant kitchens. Talking to food workers directly is important to get a good understanding of the topic. This discussion group will be composed of workers like yourself, but from other restaurants and a group leader. The discussion will last about two hours and will take place at _____. Let me emphasize that we are not trying to sell anything. The purpose of the discussion is to learn more about handwashing from food workers like yourself. We will pay the people who are part of the discussion group fifty dollars for their time.

The discussion group is scheduled for _____. Are you interested in participating?

NO. Thank you for your time (Conclude call)

YES. Good. I need to ask you a few more questions.

(these questions are to determine if the food worker meets the participation requirements.)

1. What is the name of the restaurant you work at?

IF A RESTAURANT WHERE A PARTICIPANT HAS ALREADY BEEN

RECRUITED. Unfortunately you do not meet our screening criteria. Thank you for your time. (Conclude call)

IF A RESTAURANT WHERE A PARTICIPANT HAS NOT ALREADY BEEN

RECRUITED. (Ask Question 2)

2. How old are you?

IF UNDER 18. Unfortunately you do not meet our screening criteria. Thank you for your time. (Conclude call)

If 18 OR OLDER. (Ask Question 3)

3. Are you a kitchen manager?

NO. (Ask Question 4)

YES. Unfortunately you do not meet our screening criteria. Thank you for your time. (Conclude call)

4. Do you currently work in a restaurant kitchen preparing, cooking, or storing food?

NO. Unfortunately you do not meet our screening criteria. Thank you for your time. (Conclude call)

YES. (Ask Question 4)

5. What is your job title?

6. How long have you worked in restaurant kitchens preparing, cooking, or storing food?

IF UNDER 3 MONTHS. Unfortunately you do not meet our screening criteria.

Thank you for your time. (Conclude call)

If OVER THREE MONTHS. Good. You meet our selection criteria. Now I need to tell you a little more about the study, and get a little more information from you.

I said earlier, if you agree to participate, you will have a two-hour group discussion with restaurant workers about food handling practices at work. None of the questions you will be asked during the discussion are about private or touchy matters, but it is an open discussion. If any questions make you feel uneasy, you may choose not to respond.

The discussion will be audio-taped and you will use your first name during the discussion. However, your names and your restaurant's names won't be revealed in any reports. And although we will need to get your contact information, that information will be stored separately from the tapes, and will be destroyed at the end of the study. Thus, there will be no link between the tapes and the names of people who participated, and what you say will be kept private. Also, only people involved in this study will have access to the tapes.

If you would like to get more information about the study or your rights as a participant, I can give you a phone number to call.

At what telephone number would you like our group leader to call you for a reminder phone call about the focus group?

At what address would you like for a packet of study information and a reminder letter to be sent to you?

Thank you for your agreement to participate. Once again, the time and date of the discussion group is: _____. When you have received the study information packet please feel free to call me if you have any questions.

The information packet will be arriving in the mail. I look forward to meeting you at the discussion group.

APPENDIX D: Participant Reminder Phone Call

Hi this is Aimee Pragle with the Department of Human Services is _____ there?

(Participant is on the phone)

Hi, this is Aimee Pragle with the Department of Human Services calling to remind you of the time, date and location for the handwashing focus group. The time is _____, date _____ and location is _____.

Do you have any questions or concerns about the focus group?

YES

(discuss questions and concerns with participant)

NO

Thanks for your time. I look forward to meeting you at the focus group.

APPENDIX E: Handwashing Focus Group Script

I. Introduction (5 minutes)

- Welcome everyone, and thanks for participating in this handwashing focus group. My name is Anne Gillies, I'll be moderating our discussion today. My colleagues are Aimee Pragle, the primary researcher on this project, and James Mack, with the Oregon Department of Human Services, on assignment to the CDC.
- We appreciate your willingness to be here tonight over the dinner hour. Please enjoy the refreshments during the course of our conversation. Feel free to get up and move around the room as you need to. The restrooms are located _____. Don't hesitate to take care of your needs during our time together.
- First, some background: this evening's discussion is part of a study the Oregon Department of Human Services and CDC-sponsored Environmental Health Specialists-Net or EHS-Net is doing on handwashing in restaurants. We want to get a better understanding of how easy or hard it is for you and other restaurant workers to work in ways that promote handwashing practice. You are the experts, so we are relying on you to share your experiences and knowledge with us. Information from you about what you do and why you do it is important to our study.
- This evening we will have about two hours of conversation. My goal is for us to be done here by _____. After everyone introduces themselves, we'll open things up with some questions. We have about three general areas to cover, so I'll be asking some follow-up questions and moving us along between topics in order to make sure we cover everything. Please take your time and think about what experiences you can share that are related to each question.
- Please approach this as an informal discussion. There are no right or wrong answers. We're interested in learning about your opinions, and we expect to hear different points of view. So please share your thoughts and ideas, even if they are

different from what others have said. None of the questions you will be asked are about private or touchy matters, but it is an open discussion. If any questions make you feel uneasy, you can choose not to respond.

- The discussion will be audio-taped, so that a summary report can be prepared. Your names and your organization's names won't be included in the final report. There will be no link between the tapes and the names of people who participated, and what you say will be kept private. Only people involved in this study will have access to the tapes, and once the tapes have been transcribed they will be destroyed. Your name will not appear on the final transcription, a number will be used to identify each person on the transcription. At the end of the evening, you will each receive an envelope containing \$50 in cash.
- We do ask that you agree to a few ground rules for this discussion group. Please identify yourself by your first name before responding, and please have only one person speaking at a time. Please, no side conversations, so we can be sure that everyone will be able to hear. If you are concerned about your comments reflecting on you, you may use a made up name, just remember to use that name throughout the entire discussion. So all of you feel free to share your experiences and opinions, we ask that you treat this conversation as confidential. Whatever is said in this room stays here. Everyone willing to agree to this?
- Please let me answer any questions or concerns you have before we get started.
- Would each of you please briefly introduce yourself by first name only, and tell us what kind of restaurant you work for, what kind of work you do in that restaurant and how long you have been working in restaurant kitchens?

II. What do you do to wash your hands in the workplace

- Steps
 - ✓ Run warm water.
 - ✓ Soap & lather your hands.
 - ✓ Scrub your hands thoroughly (approximately 15-20 seconds).
 - ✓ Dry your hands with single-use towel, cloth towel roll, or air dryer.

- Frequency
- How long
- In what situations
 - ✓ After using the toilet and again when entering work area.
 - ✓ After handling raw foods.
 - ✓ After smoking, eating, or drinking.
 - ✓ After blowing nose.
 - ✓ After handling dirty dishes.
 - ✓ After handling garbage.
 - ✓ Before starting work.
 - ✓ Before putting on gloves.

III. What gets in the way of you washing your hands or others washing their hands?

- Barriers
- Opinions
 - ✓ Washing my hands can make them dry and wrinkled
 - ✓ Washing my hands causes people around me to make negative comments.
 - ✓ Handwashing is inconvenient.
 - ✓ Handwashing takes too much time.
 - ✓ Dirty restrooms or sink areas are a reason for not washing my hands.
 - ✓ No sink nearby is one reason for not washing my hands.
 - ✓ If I wear gloves, handwashing is unnecessary.

III. What do people need in your workplace to wash their hands the way the guidelines recommend?

- Training
- Management
- Resources
- Recommendations

- a. Hand sanitizers should not substitute for handwashing.
- b. Hand sanitizers should only be used after hands have been thoroughly washed and dried.
- c. Hands should be washed and dried before putting on gloves.
- d. Gloves should be changed between tasks.
- e. Fingernails should be kept short.
- f. Food handlers should wash their hands before preparing food.
- g. Hands should be washed after handling raw meat or poultry.

IV. Closure (5 minutes)

- Thank you very much. We appreciate your taking the time to visit with us and with each other this evening, and we've had some good conversations.
- Are there any last comments or questions before we wrap up this evening?
- Just to remind you, this study is a joint project of the Environmental Health Specialists-Net (EHS-Net) through the Centers for Disease Control and Prevention (CDC) and the Oregon Department of Human Services. A primary goal of this collaboration is to develop interventions to promote good handwashing practice in food establishments. To do this, it is vital that we understand the handwashing knowledge, attitudes and practices of food workers. Because the factors that affect handwashing are not well understood, and because you bring first-hand knowledge of food safety practices at your individual restaurants, hearing your experiences and opinions is valuable learning for us.
- The next step in this study is to use the information you've given us to develop manager and food worker interviews based on the key issues addressed during this discussion. I want to remind you that your names and the names of your employers will not be revealed in this or any other part of the study.
- In closing, let us just say that your knowledge and understanding of the restaurant environment will be an important part of our effort to find new ways to promote safe food-handling practices. Thank you for participating; we've enjoyed spending this time with you.

- We're now done for tonight. As I mentioned before, the envelopes you are receiving contain \$50 in cash. Have a good evening.

APPENDIX F: Pre-Survey Letter

Dear Sir or Madam:

The purpose of this letter is to let you know about a study that is being conducted jointly by Oregon Department of Human Services and Oregon State University. My name is Aimee Pragle and I am an M.S. candidate in Environmental Health & Safety Management at Oregon State University. I am the student researcher assisting with this study. The purpose of this study is to find out food workers' opinions about handwashing in restaurants by conducting surveys with food workers. The issues addressed by survey respondents will assist the Oregon Department of Human Services in developing effective interventions designed to promote safe food handling among restaurant food workers.

Your restaurant may be picked at random from a list of restaurants to participate in the study. We will be randomly selecting restaurants to participate between the dates of 04/01/2004 – 05/30/2004. A recruiting call might be made to your restaurant to extend an invitation to your establishment to participate in a handwashing survey. If your restaurant is one of the ones selected, we would appreciate your participation. Food workers will benefit from this project in that they will have the opportunity for additional learning regarding handwashing and food safety.

The way this survey will work is that I will bring the written questionnaire surveys to your restaurant at a date and time that is convenient for you and your workers. All available food workers will be invited to fill out a survey. To ensure confidentiality of the surveys, I will collect the surveys immediately upon their completion. Your involvement will last for approximately 15 minutes.

The survey will be anonymous in that no identifying information such as the names of participants' or your restaurant's name will be collected. You can be sure that the opinions you provide on this survey will be kept fully confidential to the extent permitted by law and are in no way connected to your restaurant establishment.

The purpose of this survey is educational. We are looking for ways to improve handwashing education provided to food workers at restaurants. Any questions regarding this study, please feel free to contact me at _____ or Anna Harding, Oregon State University at _____.

Sincerely,
Aimee Pragle, M.S. Candidate

APPENDIX G: Survey Phone Recruitment Script

Hello my name is Aimee Pragle. I'm calling from the Department of Human Services. May I please speak with the manager?

(Once person is on the line)

Hello my name is Aimee Pragle. I'm calling from the Department of Human Services. We're working with Oregon State University on a research study to learn more about food workers' opinions about handwashing in restaurant kitchens. Did you receive the letter we sent explaining the details of the survey study?

NO. (Share information about the letter)

YES. Great. (Continue with script)

Your restaurant was randomly chosen, as the letter indicated we would like to invite you to participate in this study. We'd like to set a time at your convenience to have all available food workers fill out a short questionnaire. This should take about 15 minutes of you and your employees' time.

Having your restaurant participate is very important to help the Department of Human Services design food safety education programs to assist restaurants in Oregon. Having food workers and managers fill out informational surveys is really important to get a good understanding of the topic.

Would you be interested in participating in the survey?

NO. Thank you for your time (Conclude call)

YES. Great. We would like to do this within the next 2 weeks, when would be a good time for me to bring the surveys for available food workers to fill out?

(Confirm date and time with manager)

Thank you for your agreement to participate. Once again, the time and date of my visit to your restaurant to administer surveys is: _____. I will be sending you a reminder letter about the study. The packet will also have a recruitment flyer for food workers. If you could please post the flyer so food workers can make a decision if they would like to participate in the survey.

The survey will be anonymous in that names of restaurants, participants and contact information will not be collected during the survey process. Participant's responses

will have no identifying numbers linked to any names or contact information. Surveys will remain in a secure location and access will be limited to the principal investigator and student researcher. The surveys will be kept in a locked filing cabinet when not in use. Measures will be in place to ensure the confidentiality of respondents' survey information.

If you would like to get more information about the study or your rights as a participant, I can give you a number to call.

Please contact me, Aimee Pragle at (541) 738-6424 if you have any questions about the study.

The information packet will be arriving in the mail. I look forward to meeting with you and your employees.

APPENDIX H: Manager Survey Informational Letter

Dear _____ :

Thank you for agreeing to participate in the food workers' opinions about handwashing survey. The study is being conducted jointly by Oregon Department of Human Services and Oregon State University.

This is a reminder to let you know I will be visiting your restaurant to administer the survey on:

(Date)

(Time)

Learning from food workers and managers about their handwashing opinions is a valuable part of this study. This survey will be completed by a small, but representative sample of restaurants, so your participation is important and appreciated.

This letter also contains an informational flyer for food workers. Please share recruitment flyer information with food workers to ensure they have an understanding of the study and can make a decision if they would like to participate.

Please keep in mind the purpose of this survey is educational. You can be sure that the opinions you provide on this survey will be kept fully confidential to the extent permitted by law and are in no way connected to your restaurant establishment. At the time of my visit, I'll bring an informed consent document for the participating food workers. The purpose of this document is to give participants more information so they can decide if they would like to participate in the study.

Any questions regarding the study, feel free to contact me at _____ or via e-mail at _____ and/or Dr. Anna Harding, Oregon State University, _____ or via e-mail at _____.

Sincerely,

Aimee Pragle
M.S. Candidate
Oregon State University

APPENDIX I: Food Worker Survey Recruitment Letter

Food Workers Wanted to Complete Survey Questionnaire

Please consider participating in a study about handwashing and food workers.

Participants will be asked to fill out a short survey that will take about 10 minutes

A representative from the Department of Human Services will be at your restaurant on _____ (Date) _____ at _____ (Time) _____ with surveys for you to fill out if you're interested.

We are inviting you to participate in this survey study because you are a restaurant employee at least 18 years of age or older currently working in a restaurant kitchen as a food worker.

Taking part in this survey study is voluntary. You may choose not to take part at all. If you agree to participate in this study, you may stop participating at any time.

You do not have to answer any questions on the survey that make you feel uncomfortable.

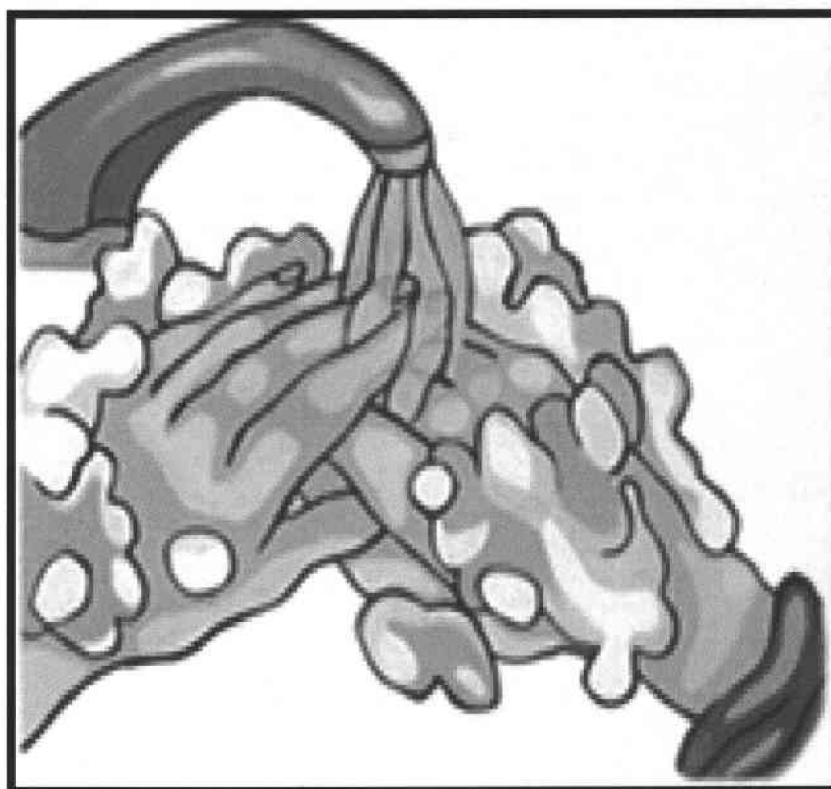
The purpose of this survey is to learn more about food safety in restaurants. The results will be used to help state and local agencies involved in food safety to improve existing public education programs.

This study will help us learn more about food workers' beliefs about handwashing and will help state and local agencies create food safety education and training.

Questions are encouraged. If you have any questions about this survey study, please contact: Anna Harding at _____ or by e-mail at _____ and/or Aimee Pragle at _____ or by e-mail at _____. If you have any questions about your rights as a research participant, please contact the Oregon State University Institutional Review Board (IRB) Human Protections Administrator at _____ or _____.

APPENDIX J: Handwashing Survey

FOOD WORKERS' OPINIONS ABOUT HANDWASHING PRACTICES



A Study Conducted by Oregon Department of Human Services and Oregon State University

We are very interested in learning more about your opinions about handwashing practices. All of your answers and comments will be kept strictly confidential to the full extent of the law. **Thank You!**

Q1. How long have you been working in restaurants? *Please circle one number.*

- 1 LESS THAN 1 YEAR
- 2 1-5 YEARS
- 3 6-10 YEARS
- 4 11 OR MORE YEARS
- 5 NOT SURE

Q2. How would you describe the ownership of this restaurant? *Circle answer yes or no for each.*

	NO	YES
1 Regional chain	1	2
2 National chain	1	2
3 Independently-owned	1	2
4 Unsure	1	2

Q3. What type of restaurant do you work at? *Circle answer yes or no for each.*

	NO	YES
1 Do you work at a family establishment?	1	2
2 Do you work at a fine dining establishment?	1	2
3 Do you work at a fast food restaurant?	1	2
4 Do you work at an ethnic restaurant?	1	2

If Yes, → What ethnicity? _____

5 Do you work at any other type of restaurant?	1	2
--	---	---

If Yes, → What other type? _____

Q4. Please indicate your opinions about what might happen if you washed your hands regularly at your restaurant. Mark your response on the scale from 1 (strongly disagree) to 5 (strongly agree).

Example: I always show up to work on time:

I strongly
disagree

1

2

3

4

5

I strongly
agree

-
- a. I will not be able to get all of my assigned duties done on time if I regularly wash my hands at work.

I strongly
disagree

1

2

3

4

5

I strongly
agree

-
- b. If I regularly wash my hands at work, I will protect restaurant customers from food illness.

I strongly
disagree

1

2

3

4

5

I strongly
agree

-
- c. I will be seen as a responsible food worker if I regularly wash my hands at work.

I strongly
disagree

1

2

3

4

5

I strongly
agree

Q4 continued. Please indicate your opinions about what might happen if you washed your hands regularly at your restaurant. Mark your response on the scale from 1 (strongly disagree) to 5 (strongly agree).

- d. If I regularly wash my hands at work, other food workers will also wash their hands.

I strongly disagree 1 2 3 4 5 I strongly agree

- e. I will be doing what people who eat at the restaurant want me to do if I regularly wash my hands at work.

I strongly disagree 1 2 3 4 5 I strongly agree

- f. If I regularly wash my hands at work, I will be protecting myself from getting sick.

I strongly disagree 1 2 3 4 5 I strongly agree

Q5. Please indicate how important the following statements about handwashing are to you. Mark your response on the scale from 1 (not very important) to 5 (very important).

a. Being able to get all of my assignments done on time is:

not very important to me	1	2	3	4	5	very important to me
---	----------	----------	----------	----------	----------	-------------------------------------

b. Being viewed as a responsible food worker is:

not very important to me	1	2	3	4	5	very important to me
---	----------	----------	----------	----------	----------	-------------------------------------

c. Protecting myself from getting sick is:

not very important to me	1	2	3	4	5	very important to me
---	----------	----------	----------	----------	----------	-------------------------------------

Q5 continued. Please indicate how important the following statements about handwashing are to you. Mark your response on the scale from 1 (not very important) to 5 (very important).

d. Encouraging other food workers to wash their hands is:

not very important to me	1	2	3	4	5	very important to me
---	----------	----------	----------	----------	----------	-------------------------------------

e. Protecting customers from getting food illness is:

not very important to me	1	2	3	4	5	very important to me
---	----------	----------	----------	----------	----------	-------------------------------------

f. Doing what people who eat at the restaurant want me to do is:

not very important to me	1	2	3	4	5	very important to me
---	----------	----------	----------	----------	----------	-------------------------------------

Q6. Indicate your level of agreement or disagreement with each of the following statements. Mark your response on the scale from 1 (strongly disagree) to 5 (strongly agree), please circle one number for each.

a. My coworkers want me to wash my hands when I am supposed to:

I strongly disagree	1	2	3	4	5	I strongly agree
------------------------	----------	----------	----------	----------	----------	---------------------

b. My manager wants me to wash my hands when I am supposed to:

I strongly disagree	1	2	3	4	5	I strongly agree
------------------------	----------	----------	----------	----------	----------	---------------------

Q7. Circle the number on the scale that most closely represents how you feel about handwashing. Please circle one number for each.

To me handwashing at the right time is:

a. convenient **1** **2** **3** **4** **5** not convenient

b. frustrating **1** **2** **3** **4** **5** not frustrating

c. practical **1** **2** **3** **4** **5** not practical

d. necessary **1** **2** **3** **4** **5** not necessary

Q8. Indicate your level of agreement or disagreement with each of the following statements. Mark your response on the scale from 1 (strongly disagree) to 5 (strongly agree).

a. I always regularly wash my hands at work:

I strongly disagree	1	2	3	4	5	I strongly agree
------------------------	----------	----------	----------	----------	----------	---------------------

b. I can easily find a way to regularly wash my hands at work:

I strongly disagree	1	2	3	4	5	I strongly agree
------------------------	----------	----------	----------	----------	----------	---------------------

Q9. Please indicate how well the following statements match your handwashing intentions. Mark your response on the scale from 1 (extremely unlikely) to 5 (extremely likely).

a. I intend to wash my hands in every situation I need to:

very likely 1 2 3 4 5 very unlikely

b. I intend to wash my hands when I believe I can do so conveniently.

very likely 1 2 3 4 5 very unlikely

c. During a busy time at the restaurant, I intend to wash my hands.

very likely 1 2 3 4 5 very unlikely

Q10. Indicate your level of agreement or disagreement with each of the following statements. Mark your response on the scale from 1 (strongly disagree) to 5 (strongly agree).

d.Sometimes I don't wash my hands because I don't have enough time.

I strongly disagree	1	2	3	4	5	I strongly agree
------------------------	----------	----------	----------	----------	----------	---------------------

e.Having a sink near my work area makes handwashing easier.

I strongly disagree	1	2	3	4	5	I strongly agree
------------------------	----------	----------	----------	----------	----------	---------------------

f. If my coworkers I work with wash their hands, I will too.

I strongly disagree	1	2	3	4	5	I strongly agree
------------------------	----------	----------	----------	----------	----------	---------------------

Before finishing the survey, we would like to learn more about your background. Be assured that all of the information you provide in this survey will be kept confidential to the full extent of the law.

Q11. What is your gender? *Please circle one number.*

- 1 FEMALE
- 2 MALE

Q12. What is your ethnicity? *Please circle one number.*

- 1 ASIAN OR PACIFIC ISLANDER
- 2 AFRICAN AMERICAN
- 3 HISPANIC
- 4 NATIVE AMERICAN OR ALASKAN NATIVE
- 5 CAUCASIAN

Q13. How old were you on your last birthday? *Please fill in the blank.*

_____ years

Q14. What is the highest level of education you completed?

- 0 NO HIGH SCHOOL
- 1 SOME HIGH SCHOOL
- 2 HIGH SCHOOL GRADUATE/ GED
- 3 SOME COLLEGE
- 4 ASSOCIATES DEGREE/TRADE SCHOOL
- 5 BACHELORS DEGREE
- 6 OTHER *Please specify*_____

Q15. We welcome any additional comments you may have concerning the issues raised in this questionnaire. *Please use the space provided below for your comments.*

Thank you for taking the time to complete this survey and for sharing your opinions with with us!