

Analyzing Food Safety Cultures: A Means to Improve Food Safety in the Catering Sector

by

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Abstract

Food safety is one of the most pertinent issues in the food service industry. Food borne illness and food poisoning can be lethal and can destroy the reputation of a catering establishment. A review of the literature points out that even though catering employees may have been formally trained with a certificate of completion, they still may not routinely practice the appropriate food safety measures and practices. More research and studies need to be conducted to survey just how widespread the neglect of proper food safety malpractices are occurring, and what kinds of remedies can be provided to make the catering service a safer food service for the consumer.

This study aimed at assessing the knowledge and practices of employees in the catering industry. A quantitative approach was utilized in this study. A questionnaire was presented to 557 respondents, representing over 40 chapters in the National Association of Catering Executives. The questionnaire was divided into three sections of food safety and included the following: Food Handling, Equipment, and Personal Hygiene. Questions asked about knowledge and the frequency of certain tasks and practices. This study analyzes descriptive, *t*-tests and ANOVA statistics to find differences between gender, training, management status, and employment status with regard to knowledge and practices. Results suggested that employees in the catering industry who work part-time need more training and development. Management was seen as more knowledgeable than non-management personnel and was seen to have more training. Overall the study found that there is a need to focus on training for employees, with

even greater emphasis for new employees. The study also found that management in the catering sector needs to focus on food safety training for part-time employees. All areas need improvement and continued research needs to focus on exactly why catering servers do not perform certain tasks related to food safety.

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Chapter 1 Introduction

This chapter addresses pertinent reasons why research needs to be conducted to explore food safety practices in the catering segment in particular. One of the most important issues of concern is the risk of food borne illness. The purpose of this study and its significance will also be attended to in this chapter.

Background

Food Safety should be practiced at all times no matter where the location. The possibility of contracting food borne illnesses can happen at home, at a restaurant, or at an event that is being catered at the beach. Without proper precautions and utilizing the practices in food safety, people are put into a risky situation. In 2006 there were 1,270-reported food borne disease outbreaks in the USA, resulting in 27,634 illnesses and eleven deaths (CDC, 2010). Some of these statistics could be prevented if the proper education and training of food safety is given to all food service industry employees. Even more disturbing are the estimates provided by the CDC in 2010 that these diseases sicken seventy-six million Americans per year, causing 300,000 hospitalizations and 5,000 deaths. The CDC contends that many of these illnesses do not get recorded (CDC, 2010). A 2009 study by Scharff estimated that food borne illnesses cost the United States \$152 billion dollars per year in healthcare, workplace, and in other economic losses The American public has also experienced nationwide alarm, as outbreaks of toxic E. coli O157:H7 has been discovered in spinach. In 2006 two hundred and five individuals were infected in 26 states and three people died in the outbreak (US FDA, 2007). In the summer of

2008 a salmonella outbreak sickened over 14,000 people in the United States. The FDA first cited that tomatoes were the source of the illness but later discovered that Serrano peppers were to blame (US FDA, 2008). Food borne pathogens have been discovered in produce that can become part of a meal at a restaurant, a fast-food establishment, or a catered affair. The threat of these pathogens in the American food base is disturbing and becomes another critical reason why food service establishments need to practice methods to reduce and prevent the passage of food borne pathogens.

Norovirus and salmonella were the leading causes of food borne disease outbreaks in 2006, the latest year for which statistics are available (CDC, 2010). Food borne outbreaks of norovirus occur most often when infected food handlers fail to wash their hands correctly after using the restroom. With so many people contracting a food borne illness every year this is a critical problem that affects all aspects of the hospitality industry, including the catering segment. Millions of people attend conferences, weddings, and other special events every year and hence catering employees need to have a basic knowledge of food safety. A caterer is defined as a service “providing single event-based food services” (US Census Bureau, 2000). These establishments generally have equipment and vehicles to transport meals and snacks to events and or prepare food at an off-premise site. Banquet halls with catering staff are included in this industry (US Census Bureau, 2000). The US catering industry includes about 10,000 companies, with combined annual revenue of \$5 billion dollars (National Restaurant Association, 2008; Valuation Resources, 2011). The very nature of catering sets up red flags when considering the risk of food borne illness outbreaks. Events demand a very fast paced delivery and many times stressful circumstances for employees. Large numbers of people are served while the food may be transported to an off-site location. The food must be kept at proper

temperatures on route and at the serving location. All of these variables can add to the increased risk of developing a food safety issue. Therefore with food borne illness still at an all-time high and millions of people attending special event functions every year, catering servers and employees need to have proper food safety training and education.

Practicing proper food safety methods and maintaining food safety in the food industry is critical for the consumer. Food borne illness poses a risk whether an individual dines at home, at a restaurant, or at an elegant catered event. Proper food safety techniques and food handling must be practiced in order to protect the consumer from serious consequences. Food borne illnesses have resulted in thousands of deaths and hospitalizations (Scharff, 2009; Yasuda 2010). One outbreak of food poisoning can result in millions of dollars of penalties, lost business, expensive lawsuits, and a tarnished reputation.

The special nature of catering events makes it very critical to practice and follow through with safe food handling methods. Events may dictate that food has to be transported long distances or the timing of the event may be off schedule due to some unforeseen incidents. Therefore those in charge must be responsive and flexible to ensure that the food will be stored and served at the correct temperature. Not only do the managers need to oversee the proper preparation, storage, and serving of the food, but all those involved in any aspect of food handling must be knowledgeable and dedicated to safe food handling practices. This includes the servers, cooks, and clean-up employees. In most catering or banquet facilities, servers handle the food in the back of the establishment and therefore it is vital that they are trained to maintain the safety of the food about to be served. Proper hygiene is a must for anyone coming into contact with the food. Training and consistent reinforcement of safe food handling practices is especially important for all employees performing catering and or banquet functions.

The Retail-Foodservice Food Safety Consortium conducted six focus group sessions on the topic of food safety education and training in 2008. A series of questions were asked to thirty participants who had training and were educated in food safety. It was found that food safety at retail and foodservice levels was in extreme need of improvement. It is surprising that with all the education and training that is available that many food service employees do not have the knowledge needed to keep guests safe. Operators who participated in the study showed a lack of understanding why food safety practices are required and lacked basic knowledge or simply do not care (Nunmer, Fraser, & Klein, 2009).

Purpose of the Study

The purpose of this study is to explore food safety measures in catering and special event programs, especially with respect to the knowledge and implementation of behaviors of food handlers in the catering sector. This study anticipates that there will be an even higher need for education and training in the catering sector due to high turnover, the expense of training part-time employees, and the high paced environment of catering which may inhibit proper food safety practices. It is also pointed out that catering servers may feel that it is not their responsibility or since they are not involved with the cooking of the food, they may feel their actions do not affect the safety or quality of the food that they are serving.

Significance of the Study

Catering is a growing industry. With over 10,000 catering companies in the United States there is a growing need for servers in this industry (National Restaurant Association, 2008; Valuation Resources, 2011). As food safety continues to be an issue in the food service industry and since food borne illness outbreaks continues to happen, maintaining a healthy

environment, which can eliminate the chance of any outbreaks, should be a top priority for business owners. Yet many companies do not take a proactive approach in guaranteeing that all employees are trained in this important area (Nummer *et al.*, 2009). With limited studies evaluating and targeting the catering/special event industry, this study highlights the need for greater improvement in overall food safety knowledge. This research sets out to show how knowledge of food safety affects the behaviors being implemented specifically in the catering sector. There are several reasons why food safety is even more important in this area than of others. Given that there are off-site events which food is either prepared off-site or transported off-site, food safety becomes more important than just making food in a restaurant. This is particularly important given that many US states do not have regulations for off-site catering.

The unique challenges of food delivery, either to off-premise locations miles away from the production area or merely as far as executing service on the opposite side of a hotel add to the criticality of proper food handling in a catering situation. Unlike restaurant servers, all catering personnel are, in essence, food production employees. Servers are responsible for setting buffet stations and also keeping the stations replenished. It is imperative that servers keep food covered properly and monitor the temperature of the food in the back of the house when running buffet style events. Catering servers are responsible for ensuring a quality product is reaching the guest as well as ensuring the guest is receiving a product safe for consumption. The unique amount of food handling required in catering situations highlights the importance of this study. The specific tasks of catering servers cannot be measured by the same standards as a restaurant server. These factors were taken into consideration when reviewing the literature and experts in the field of catering in order to develop a survey to target what catering servers should be implementing. The lack of attention to food safety in catering is seen as a weakness in the

current literature. This study offers new insight and examination of this important area and thus makes an original contribution to the literature.

Research Questions

This study set out to answer the following questions:

RQ1 To what extent are catering employees knowledgeable in the widely accepted food safety measures?

RQ2 To what extent are catering employees implementing the widely accepted food safety measures?

RQ3 Are there differences in catering employee's knowledge of the widely accepted food safety measures based on their gender, management, training, employment status, age, and experience?

RQ4 Are there differences in how often catering employees implement the widely accepted food safety measures based on their gender, management, training, employment status, and experience?

Organization of the Study

Chapter 1 introduced a background to the research and presented the purpose and significance of this study. Chapter 2 is a review of the relevant literature on the subject. Next, in chapter 3 the research methods of the study are discussed. Results are shown in chapter 4, finally in chapter 5 the findings are discussed along with implications, limitations and future research that could be conducted.

Chapter 2 Literature Review

In this chapter a literature review relating to key factors that have direct impact on safe food practices will be explored. These key factors involve the practice of personal hygiene of those coming into contact with the food, the maintenance and sanitation practices of equipment and food preparation areas, and the practices of safe food handling. These particular areas can constitute passage of pathogens if the recommended rules of safety are not taking place, and they serve as critical areas in which proper training of personnel must take place. It is important to understand and recognize the various knowledge and behaviors of the personnel as they carry out their role.

Food Safety Culture

A relatively new emerging risk factor in the food industry is food safety culture (Griffith, Livesey, & Clayton, 2010). Griffith *et al.*, (2010) propose a definition of food safety culture as the aggregation of the prevailing, relatively constant, learned, shared attitudes, values and beliefs contributing to the hygiene behaviors used within a particular food handling environment. Further studies investigating and understanding the underlying attitudes and beliefs may help to discover why and how to make a positive and balanced food safety culture at all levels.

An organization's culture is ultimately its beliefs, attitudes and values that the employee is exposed to everyday (Griffith *et al.*, 2010). For example, if an employee observes a manager continuously coming to work late, the employee may then think the lateness is an acceptable behavior in this particular work environment. In other words the workplace culture constitutes

workplace practices that reflect the visible symbols that can be specific to a business culture and maybe subject to planned change (Hofstede, 1998). Investigating the culture of an establishment and understanding the beliefs and attitudes toward food safety may help understand why employees do not perform safe practices while working. Corrective measures can then take place to rectify and improve the workplace culture especially concerning food safety practices.

Yiannas (2009) states that organizations can choose to create a strong food safety culture. Leaders are accountable for instigating a strong food safety culture since they have the power and influence to create such an atmosphere. Practicing a positive food safety culture may have the potential to reduce the global burden of food borne illness. Creating a positive food safety culture can support this process by actually changing the thoughts, behaviors, and beliefs of individuals within a group (Yiannas, 2009). Therefore it appears that by investigating the beliefs and knowledge of catering employees, specific factors which contribute to poor practices may be identified and may further suggest what management can implement in the workplace to help develop a more positive food safety culture.

Personal Hygiene

Personal hygiene with strong emphasis on hand washing is one of the most important practices of a positive food safety culture. Poor hand hygiene has been identified as a significant risk factor in spreading food borne illnesses (Guzewich, 1995; Kilgore *et al.*, 1996; Kassa, 2001). Research conducted by Redmond, Griffith, Slader, & Humphrey, (2004), further demonstrates that improper food handling practices can lead to dangerous contamination especially from raw foods. Further research in a laboratory setting (Daniels *et al.*, 2000; Olsen *et al.*, 2001),

emphasizes that if food handlers become infected and/or equipment becomes contaminated with pathogens, poor hand hygiene could definitely transmit those pathogens to customers. A majority of food caterers in a United Kingdom study acknowledged their awareness of the importance of good hand hygiene and were able to state reasons for this important behavior, that is an activity or conduct that supports reducing the passage of food borne pathogens (Food Standards Agency, 2002). However, acknowledging the importance of a behavior does not guarantee that an individual will consistently practice that behavior.

Janz and Becker (1984) suggest that individuals evaluate the perception of risk by determining whether or not they are really liable to a threat or perceived susceptibility and whether or not the threat is truly severe or a perceived severity. Therefore, even if an individual acknowledges the importance of good hand hygiene they may not practice the activity consistently. Employees who perceive a stronger severity and/or a weaker barrier may be more likely to practice protective health action (Janz & Becker, 1984). Proper training practices in the importance of personal hygiene and the enforcement of these practices can improve food safety for the public. In addition this study notes that management must limit any barriers that may deter personnel from executing hand washing or other hygiene activities.

Several models have been used in the past to investigate a wide range of behaviors that have been used to study hand washing practices in hospitals (O'Boyle & Larson, 2001) and in the home (Ralston, Brent, Starke, Riggins, & Linn, 2002). Clayton and Griffith (2008) initiated a study on hand washing, since the previous studies have been limited in actually applying quantitative psychological theory, to predict and understand the implementation of specific food safety activities and practices in the work setting. In their model they generated two components, the internal cognitive control or "perceived difficulty of hand washing", and the

more general external factors or “perceived barriers to hand washing”. The study showed a thirty-four per cent variance in hand hygiene malpractices and twenty-four per cent of the variance in intentions. Even though the variance seemed relatively small it was greater than the average proportion of variance explained in previous studies using objective measures of behavior (Armitage & Conner, 2001). Another interesting finding was that the caterers’ hand hygiene practices were influenced by subjective norms or social pressures in addition to personal considerations. Clayton and Griffith (2008) attribute this to the organizational setting of their study and that this may provide some explanation for the importance of normative beliefs. Overall, this study confirmed previous findings that there is an important distinction between perceptions of others beliefs and perceptions of others’ actions.

The food safety practices of workers, coworkers, and supervisors did affect the caterers’ intentions to carry out hand hygiene practices. Clayton and Griffith (2008) reiterate that in order to improve caterers’ hand hygiene practices it is important to target all members of the workplace. This includes those in a supervisor role. Providing off-site training in food hygiene to individual food handlers without training all members of the food handlers in the business may be ineffective in changing the caterers’ practices (Clayton & Griffith, 2008).

Clayton and Griffith (2008) have pointed out that individuals may know the importance of carrying out a duty but under certain circumstances they just don’t do it. This study clarifies that management of catering businesses cannot depend on one short preliminary training to guarantee that employees will perform the correct procedures.

Hertzman and Barrash (2007) conducted a study in Las Vegas which investigated the knowledge of catering employees with regards to personal hygiene practices and other food

safety concerns. The study found that many of the employees violated a battery of hygiene responsibilities. The following are major personal hygiene violations that occurred during the study: Hands not washed after touching body, uniform etc. (160 occurrences), and Not wearing gloves when working with ready to eat foods (131 occurrences). Other violations were hands not washed before event starts, and drinking out of improper containers near food.

The study shows a need to further gather information concerning the knowledge level of catering employees with respect to the above violations and why these violations are happening so often. Practicing personal hygiene is a key element in the prevention of passing on any type of food borne illness. A review of the literature shows a limited number of studies concerning personal hygiene with respect to catering employees, as a larger majority of studies are geared to other food service establishments.

Equipment and Food Handling

Proper food handling not only dictates that employees practice personal hygiene measures, but that equipment and service areas are free from contaminants. A number of studies have been conducted with reference to determining correct procedures in this area of food safety. Clayton and Griffith (2004) used notational analysis in their study to record and observe caterers' implementation of specific food safety practices. The sample used in the study came from a total of 170 businesses in the Cardiff Food Premises Register from South Wales. The study only used catering businesses that handled high risk foods. Prior to carrying out the notational analysis, four major food safety actions were identified as actions that food handlers consider to be important in preventing food poisoning in the work setting.

These critical actions were noted as follows:

1. Hand washing
2. Cleaning equipment, utensils, and surfaces.
3. Preventing cross-contamination
4. Ensuring that food is cooked thoroughly (Clayton, Griffith, Price, & Peters, 2003).

The results of the study determined that only 31% of the caterers followed appropriate cleaning of surfaces and equipment. The results also revealed no attempt to correctly clean surfaces and equipment 77 % of the time of the conducted observations. Eighty-five per cent of these inappropriate actions resulted in the surfaces coming into contact with potentially contaminated objects (Clayton & Griffith, 2004). A food handler, “any person involved in a food business who handles or prepares food whether open (unwrapped) or packaged (food includes drinks and ice)” (Food Safety and Hygiene Working Group, 1997) must practice appropriate safety measures in order to prevent the passage of contaminants. As seen in the Clayton and Griffith (2004) study the quantity of inappropriate actions performed by the food handlers was excessive. Further studies are needed to determine how common these inappropriate actions are taking place in the catering sector, and how the situation can be improved. Catering employees that have been working for several years may gain greater experience in understanding their role in the business operation and may also gain greater knowledge about correct food safety procedures. Farrish, Kitterlin, Hertzman, and Stefanelli (2009) conducted a study to determine if the younger inexperienced workers would show a

greater tendency to violate and or participate in risky behaviors in a food service setting. The study did not show any significant difference in the age factor or food service experience compared to the number of self-reported food safety practices. However, the study did show significance in noting that students of hospitality in a higher-level institution do show a greater positive practice and knowledge about food safety, compared to employees who have not been involved in an educational program of hospitality at the college level.

The very nature of how catering foods are prepared, stored, transported, and the designs of the kitchens and other food preparation sites, makes the potential for food borne illness and contamination a real threat to the consumer. Therefore, the food handlers in this industry must be involved in preventing the spread of pathogens and must be aware of their vital role in this prevention. The researchers involved in the notational analysis of tracking and observing the behaviors of food handlers in the catering realm reveal that cross-contamination and inappropriate hand hygiene is a definite issue. The study by Clayton and Griffith (2004) did not show that the notational method of observations helped to monitor temperature issues involved in safe food preparation and storage, but it did prove to be very helpful in monitoring proper hand hygiene and cleaning to prevent cross-contamination. Still observations of this type would be time consuming and may be impractical for many businesses to employ. Research in this study shows that notational analysis could be a useful tool for management in assessing the risk of cross-contamination in their facility or work site.

The study of Hertzman and Barrash (2007) also looked at assessing the knowledge of catering employees in Las Vegas. This study found a major concern relating to food handling. When employees moved food from warming or refrigerated equipment the temperature was not monitored. This is an alarming concern especially since the management was not aware of the

situation. When food temperature is not checked food could be served to guests in the danger zone. The danger zone may allow bacteria to grow. The danger zone temperature is 40 to 135 degrees F. The study shows a clear need of better training and education for catering employees involved in the food industry.

The Retail-Foodservice Food Safety Consortium conducted six focus group sessions on the topic of food safety education and training in 2008. This group which operates as part of a U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service Grant, recognizes that regardless of the size or complexity of any food service operation, the on-site management of each food establishment shares a common responsibility. The focus groups representing the Retail-Foodservice Food Safety Consortium asked a series of questions related to food safety at retail and various food service levels. The same questions were asked to a total of thirty participants who had stated that they had been trained and educated in the topic of food safety at their job site. It was discovered after the sessions had concluded that food safety at the retail and food service level was in extreme need of improvement. The individual comments on the food safety topic showed that many of the food handlers questioned failed to observe and use proper safety procedures and techniques. Some of the comments included the following:

1. It takes longer to be safe or it is inconvenient.
2. Operators do not understand why food safety practices are required, (they lack basic knowledge or simply do not care).
3. Operators practice unsafe food practices at home and bring that experience with them to the job site.
4. Operator management does not provide the correct incentives to get food-safe behaviors which

are proper training, motivation, supervision, and reward.

The conducted study of food safety awareness clearly showed a need for improvement in this area. The focus group participants remarked that there are barriers to learning and practicing food safety. Some of their responses in reference to these barriers are as follows: some of the workers have diversity of languages; there is a lack of time and money to incorporate proper training, socioeconomic standards, lack of interest, cultural differences, skill level, motivation of the employees, operators' lack of time, and lack of feedback on safe food behaviors. One of the most common comments related by focus groups was that many people know better, but just do not practice the correct food safety behaviors anyway. They also remarked that management does not emphasize food safety as a priority and that they are so overwhelmed with their duties that other tasks are more pressing to work on (Nunmer *et al.*, 2009).

This study raises a red flag in the food service industry. This study shows that more information is needed to understand the “barriers” that the respondents remarked about. Barriers that inhibit employees from practicing safe behaviors should be identified. Future studies can focus on better training of employees and especially management, to determine how to expand better communication between the two in order to curtail these barriers. In addition studies on safety awareness should be conducted on a broader scale thereby gaining more reliable data to understand the scope of the problem

Literature Implications for the Current Study

Indeed there have been several studies addressing the issue of food safety concerning the general public. However, a vast majority of these studies have centered on fast-food establishments, restaurants, school and hospital cafeterias, and other eateries. The unique

differences between the catering sector and the above establishments call for more studies that analyze the practices of food safety in catering. A study completed by Mitchell, Fraser, and Beacon (2007) determined that job stress, work pressure, and a high-paced environment can definitely contribute to poor food safety on the worksite. The catering worksite is quite demanding and lends to a stressful, fast-paced environment making it vulnerable to food safety malpractice.

Studies completed in reference to catering and food safety issues such as that of Hertzman and Barrash (2007) appear to be hampered by various limitations. For example, the Hertzman and Barrash (2007) study provided a very low response rate given by the caterers. This particular study was only conducted in the Las Vegas area, and though it did survey eighteen different events, all the events were organized by the same company. This study needs a larger geographical sampling thereby providing more respondents in order to show discrepancies in the knowledge of the catering personnel. The study was conducted by the use of a snowball sample and may have exposed biased results. The researchers did not ask the employees surveyed about their exposure to any safety training programs or about their educational backgrounds. The Hawthorne Effect may have taken place since the servers and employees were openly observed during work time. Other studies including several by Clayton and Griffith (2002, 2004, 2008) though notable were completed outside of the US and predominately in the United Kingdom. The studies provided in the United States are few and seem to only cover limited areas. The present study will provide a national survey representing a large geographic area of the United States. It focuses on servers, front-line staff, and includes management. Research exclusive to the catering industry has not yet examined the United States as a whole. This study also combines the safety issues of equipment, personal hygiene, and food

handling addressed in other research (Nummer *et al.* 2009; Yiannas 2009; Clayton *et al.*, 2003; Clayton, 2004; Clayton & Griffith, 2002, 2004, 2008; Griffith *et al.*, 2010) into one study as a whole.

Summary

This chapter has reviewed the relevant literature regarding food handling culture, personal hygiene, proper equipment, and food handling, while examining the implications of a comprehensive food safety understanding. This review found strong links between processes and procedures and the creation of a food safe culture. As stated at the outset, there has been a lack of applying these concepts to catering operations and personnel. The review of the food safety literature has served to inform the research conducted in this study and offers the foundation upon which the ultimate conclusions and implications made in this study are drawn.

Chapter 3 Methods

This chapter discusses the methods employed in this study. Topics included are the sampling and data collection procedures, instrument development, ethical considerations, and statistical analyses.

Sampling and Data Collection

A survey-based design was used in this study. The participants who received the survey were the member businesses in the National Association of Catering Executives. This association is the largest and oldest of its kind in the world. Established in 1958 in New York City, this association includes approximately 3,500 members from different aspects of the catering industry. The mission of this association is to provide catering and event professionals the resources, education, and networking to succeed in the catering industry. This association includes fifty chapters in thirty US states. Each chapter averages twenty catering/banquet businesses. Members include a wide range of employees in the industry including catering executives, management personnel, servers and cooks (NACE, 2011). Email addresses were obtained on the NACE website by looking at each chapter. To the knowledge of the researcher, these addresses have not been used in another academic study. Companies included were floral design, disc jockeys, and table and chair rental businesses; other companies that do not have catering were not invited to participate. In total, 557 individuals, representing many different companies were asked to participate in this study. An informational email was initially sent to these businesses one week prior to the invitation for participation. These emails were sent to managers and supervisors who were then asked to forward the emails onto their staff. The

emails were also sent to those servers and other employees that belong to the association. In the informational message, the potential respondents were encouraged to participate in this effort and were assured of the anonymous nature of the activity. Another email was sent that included a link to the survey, which could be taken online for convenience. Two follow up emails were sent out to the participants to urge them to participate in the study.

Due to a slow pace of completed surveys returning, four companies were willing to participate and preferred the research to be completed by a hard copy handout. The hard copy surveys were dropped off for participants to complete. The surveys were picked up by the researcher after the event was over. The format, design, and content of the hard copy survey were exactly the same as the survey on the Internet. When investigating the responses obtained from the two formats, that is Internet-based and hard copy handout, there were no remarkable response variations between the two methods. Of the initial emails sent to the 557 individuals and the hard copies that were distributed by the researcher to these four companies, 98 responses were submitted via the Internet survey and 157 responses were completed from the hard copy surveys. Tables 1 and 2 below provide the demographics and professional information of the participants.

Table 1 shows a general even split between male and female participants. Male respondents accounted for 47.8% of the sample, while females accounted for 52.2% of the sample. Approximately 62% of the respondents classified themselves between the ages of 20 to 29 years of age. About half of the respondents have obtained some college/technical school courses and approximately 26% of the respondents have received a High School diploma. Respondents who have less than one year of experience to one year accounted for 43.9% of the sample and respondents who have worked in the industry over 3 years accounted for 42% of the sample.

Only 13.7% of the group had experience from 2 to 3 years. Most of the respondents, 72%, were servers in the catering/banquet industry while those serving as captains accounted for 7.5 %.

The working status of most of the respondents was part-time (59.2%) and the full time employees accounted for 39.6% of the sample.

Table 1: Demographic Profile of Respondents

Gender	<i>N</i>	%
Male	122	47.8
Female	133	52.2
Status		
Part-time	151	59.2
Full-time	101	39.6
Years of Experience		
<1 to 1 year	112	43.9
2 to 3 years	35	13.7
> 3 years	107	42
Missing*	1	.4
Age		
Younger than 20 years	32	12.5
20-29 years	160	62.7
30-39 years	25	9.8
40-49 years	28	11.0
50-59 years	4	1.6
60 years or older	6	2.4
Education Level		
None/Some High School	3	1.2
High School Graduate	67	26.3
Some College/technical school	129	50.6
College Graduate	49	19.2
Graduate School	7	2.7

*Denotes non response

Information from Table 2 clearly shows that ServSafe (NRAEF, 2010) was the most utilized program that was used for employees that had previous food safety training. This is a nationally recognized food safety-training program. However, this table also shows that training was not prevalent with 72.9% of the group answering that they had not received any prior training.

Table 2: Professional Characteristics of the Participants

	<i>N</i>	%
Food safety programs completed		
ServSafe	54	21.2
Responsible Vendor	7	2.7
Food Safety Manager’s Certification	6	2.4
Barista Training	2	.8
CARE	1	.4
TAP Series	1	.4
None	182	71.4
Management Position	<i>N</i>	%
Yes	46	18
No	209	82
Previous Food Safety Training	<i>N</i>	%
Yes	69	27.1
No	186	72.9
Responsible for Training	<i>N</i>	%
Yes	54	21.2
No	200	78.4

Survey Instrument

The development of the survey instrument went through several stages. First, literature was gathered and reviewed to find main focal points of what has been studied and what survey instruments were used. After reviewing main points from the literature, several county health inspection checklists were examined from several counties in the state of Alabama, USA. After reviewing the information more focus points were added that were used in focus groups utilized specifically for this study. Focus groups consisting of three groups of ten for a total of thirty participants were formed. Three different groups of catering servers and managers employed by

catering and banquet facilities with experience of 5 years attended meetings on Sunday May 2, 2010 at 3:00 P.M., Wednesday May 5, 2010 at 7:00 P.M., and Sunday May 9, 2010 at 3:00 P.M.

Thirty of these participants were employed in the state of Alabama. The sessions were moderated by the researcher. A total of three sessions lasting on an average of forty-five minutes were conducted. The first session lasted forty minutes and consisted of five females and five males all employed by the same establishment. Four participants were part of the management team and six were front line servers. The participants were asked what factors they felt were important in addressing food safety in general. Specific food safety questions were addressed in reference to catering and banquet functions. Notes were taken by the researcher and a list of the discussed factors was compiled. The same process was repeated for two more sessions. The second session consisted of six females and four males, all of which were servers and worked at four different establishments. This session lasted sixty minutes in length. The third session had five females and five males, whereas four participants were management employees. This session lasted thirty five minutes.

The information was then sent via email to the participants after all responses from the three sessions were compiled. The respondents were asked to add any other factors that they felt would be of value or any factors that were not discussed during the focus group meetings but were not included in the compiled list. The revised list was collected one week later. The list was emailed to all participants asking them to again refine the list by adding any factors missed or what could be added. All the participants responded within two weeks. The entire process was repeated and yielded more results. The mode of questioning used in the process was the Delphi Technique, defined as a small group of experts selected from a particular industry who make responses. Responses given are then compiled and repeated (Kaynak, Boom, & Leibold,

1994).

The resulting survey instrument consisted of eleven general questions about demographics. In addition to the demographic questions, the survey included 32 statements about the holding of food, personal hygiene, and equipment. Participants were asked to evaluate these statements on a 5-point scale on how much they agreed with the statement and also were asked to rate statements on the frequency that they occurred in their area. The survey instrument used in the research is available in Appendix II.

Pilot Study

Following the development of the initial survey instrument, and to minimize ambiguity of the survey instrument, a pilot study was used. The instrument was administered to banquet and catering servers in the Lee County area of Alabama. It was administered to 50 participants in the area who have several years of employment in the catering sector and did not participate in the focus groups. These employees were chosen at random. Feedback and comments were received about relevance and clarity of the survey questions. The participants were timed while completing the survey, which took on average 10 minutes to complete. The instrument was then revised according to select comments and feedback from the participants.

Non-Response Bias

Primary data used in this study was collected through both Internet and printed formats. There were no seen marked response variations between the two methods. The format used for both methods was exactly the same as seen on the Internet and in the handout version of the survey. A common method to assess non-response bias is to compare characteristics between

early respondents and late respondents. If no significant differences are found then the survey results are likely to be more general to the population. The sample in this study was split between those that answered before the reminder emails and those that answered after the final reminder email. Handout surveys were split between those that were answered during the time of the reminder emails being sent out and after they were sent. Analysis was used to compare group means from food handling, equipment, and personal hygiene, using an independent samples *t*-test. No significant differences were found between the groups. This offers support and a general sense of confidence in the findings of this study.

Furthermore, data collected was also checked for normality of distribution, which met all standards. Visual and statistical test (i.e., kolmogorov-Smirnov) indicated that there were no significant differences between the different groups of one variable. However, due to the notable difference in the number of management and non-management participants, a random sample of the management group was generated by SPSS *random number generation* function, which showed no significant differences in the results.

Ethical considerations

The instrument used in the study was constructed to meet standards required for conducting human research. The researcher is CITI trained and certified. The Internal Review Board of Auburn University reviewed the study prior to administration. All ethical considerations were met and have been approved for conducting research.

Data Analysis

Using the Windows version of SPSS 18.0, Statistical Package for Social Sciences, each

section of the survey (i.e., Equipment, Personal Hygiene, and Food Handling) were compared along the variables of gender, managerial position, previous training, and employment status. Independent samples *t*-tests were employed for this purpose. One- way ANOVA tests were performed to examine any group differences construed with regards to the main dimensions (Equipment, Personal Hygiene, and Food Handling) between the different age groups of participants as well as the range of experience that participants have. Additional analyses utilized several descriptive statistics.

Summary

This chapter discussed the research methods employed in this study. The process of developing the survey instrument was discussed. The statistical analysis procedures were also reviewed.

Chapter 4 Results

This chapter presents the results obtained in the study. It will be divided into three sections. The first section will include results from the survey respondents in the areas of food handling, equipment, and personal hygiene of *t*-tests to show differences in the areas of gender, training, management, and employment status. Section two will show the results concerning amount of experience and age using an ANOVA test to pinpoint significant differences. Section three is a summary of all the results found.

Overall Results

Overall this study found that the lack of training of employees greatly affects their skills needed to perform their job with respect to food safety regulations ($t=6.936, p<.000$). Taking into account that management tended to have certification and knowledge about correct food safety; the food handlers and servers that are those who most often are actually coming into contact with the food also need training to succeed. The study revealed a lack of training especially in the sections concerning use of equipment, personal hygiene, and food handling for non-management personnel. The study found that experience and employment status are linked to an employee's knowledge and frequencies in performing tasks associated with personal hygiene, equipment, and food handling. Information from the study shows that many times management feels that proper procedures are performed more often than non-managerial employees. The study reveals a clear gap between these groups regarding their opinions of whether or not correct safety measures are taking place.

Food Handling

The results in Table 3 shows one significant difference between male and female respondents with regard to the items related to food handling ($t=-2.530, p<.012$). Information gathered from Table 3 relates some statistically significant differences in food handling with regards to whether respondents were managers or non-managers. The agreed responses were higher for managers in all questions regarding food handling when compared to the non-managerial responses. There were significant differences noted in all questions including: 13, ($t=2.542, p<.012$), 15 ($t=3.927, p<.000$), and 16 ($t=3.966, p<.000$). One noticeable difference was found in Question 15, which asks about items being covered and labeled properly. The responses from managers were significantly higher than what servers and other non-managerial employees thought. Management feels that their establishment understands and knows proper guidelines more so than what is shown by the results. Other significant findings were in questions 11 ($t=.5.147, p<.000$), 12 ($t= 5.051, p<.000$), and 14 ($t=2.650, p<.009$).

Statistically significant differences were found when comparing the responses of employees who have had training as opposed to those who have not had training in all questions. Those who have had training agree that food is kept safe during transportation while those who do not have training responded that the food is not kept safe ($t=6.936, p<.000$). A difference in response was also noted between these two groups when questioned about the way cold food items are monitored. Trained employees remarked that food is monitored and those who are not trained disagreed significantly ($t=6.797, p<.000$). Survey question 13 which asks if employees feel checking food temperature prevents food borne illness, shows a significant difference between those trained and not trained ($t=4.625, p<.000$). Those who are not trained are more likely not to agree.

There were also several differences found when comparing the groups who work part-time and those that work full-time. Full-time workers were more likely to agree that food was kept safe during transportation ($t=-5.194, p<.000$) and also that cold food items are monitored correctly. Full-time employees were also more likely to agree that food stored in other locations is covered and labeled properly ($t=-4.236, p<.000$). Perhaps the differences in the responses may be due to the fact that full-time employees have had more time on the job and have learned from their extra experiences.

Table 3: *t*-test Analysis on Food Handling Knowledge

Item		Mean	S.D	<i>t</i> -Value	Sig	
In my area, food is kept safe during transportation to off-site events.	Gender	Male	3.84	.856	.484	.629
		Female	3.78	.924		
	Management	Yes	4.39	.774	5.147	.000
		No	3.68	.865		
	Training	Yes	4.39	.826	6.936	.000
		No	3.59	.815		
	Status	Part-time	3.58	.882	-5.194	.000
		Full-time	4.15	.792		
I feel that in my area cold food items are properly monitored for temperature.	Gender	Male	3.16	1.143	1.636	.103
		Female	2.92	1.181		
	Management	Yes	3.78	1.228	5.051	.000
		No	2.87	1.088		
	Training	Yes	3.78	1.199	6.797	.000
		No	2.75	1.026		
	Status	Part-time	2.69	1.008	-5.910	.000
		Full-time	3.51	1.197		
I feel checking food temperature can prevent food borne illness.	Gender	Male	4.35	1.020	-1.079	.281
		Female	4.48	.884		
	Management	Yes	4.74	.681	2.542	.012
		No	4.35	.989		
	Training	Yes	4.86	.355	4.625	.000
		No	4.26	1.049		
	Status	Part-time	4.28	1.084	-3.062	.002
		Full-time	4.64	.626		
I ensure chafers are properly lit and functioning before food is placed in them.	Gender	Male	3.75	1.154	2.530	.012
		Female	4.36	2.577		
	Management	Yes	4.46	.690	2.650	.009
		No	3.98	2.227		
	Training	Yes	4.59	.577	2.536	.000
		No	3.87	2.340		
	Status	Part-time	3.97	2.536	-1.224	.006
		Full-time	4.29	.841		

I ensure cold food items are always placed on ice to keep temperature correct.	Gender	Male	2.65	1.272	1.586	.114
		Female	2.39	1.308		
	Management	Yes	3.17	1.495	3.927	.000
		No	2.37	1.202		
	Training	Yes	3.03	1.350	3.983	.000
		No	2.32	1.223		
	Status	Part-time	2.34	1.166	-2.400	.017
		Full-time	2.73	1.435		
I often ensure in the back of the house backup items for buffets are labeled and covered properly.	Gender	Male	3.68	1.062	1.362	.2175
		Female	3.49	1.091		
	Management	Yes	4.13	.957	3.966	.000
		No	3.46	1.069		
	Training	Yes	3.88	1.105	2.817	.005
		No	3.47	1.051		
	Status	Part-time	3.35	1.078	-4.236	.000
		Full-time	3.92	.997		

As indicated in Table 4, there were distinct differences found between the age group of individuals younger than 20 compared to the age group of 30 and 40. A key difference was found in post hoc tests for survey question 13. Question 13 discusses if checking the temperature of food will prevent food borne illnesses. Results show that the older age groups agree with this statement more so than younger employees ($F=4.769, p<.000$). The difference in judgment may be explained in that the older workers have had more training than the younger workers and have had more on the job experience. Question 16 which discusses if backup items of food are properly labeled and covered revealed a disparity in response from the two age groups as well. The older age group feels that these food items are more likely to be covered and labeled properly more so than the younger group. The older group may make this judgment again because of their extended experience and training.

Table 4: ANOVA Analysis of Age and Food Handling Knowledge

Item		Mean		Sum of Squares	d.f.	Mean Square	F	p-value
In my area, food is kept safe during transportation to off-site events.	Younger than 20	3.44	Between Groups	8.580	5	1.716	2.214	.053
	20-29	3.79	Within Groups	193.004	249	.775		
	30-39	4.12						
	40-49	3.96						
	50-59	4.25						
	60 or over	4.00						
I feel that in my area cold food items are properly monitored for temperature.	Younger than 20	2.91	Between Groups	15.500	5	3.100	2.337	.043
	20-29	2.95	Within Groups	330.249	249	1.326		
	30-39	3.48						
	40-49	3.42						
	50-59	2.00						
	60 or over	2.83 3.03						
I feel checking food temperature can prevent food borne illness.	Younger than 20	3.93	Between Groups	20.108	5	4.022	4.769	.000
	20-29	4.35	Within Groups	209.994	249	.843		
	30-39	4.72						
	40-49	4.89						
	50-59	5.00						
	60 or over	5.00						
I ensure chafers are properly lit and functioning before food is placed in them.	Younger than 20	2.87	Between Groups	59.371	5	11.874	2.949	.013
	20-29	3.99	Within Groups	1002.496	249	4.026		
	30-39	4.28						
	40-49	4.61						
	50-59	4.25						
	60 or over	4.83						
I ensure cold food items are always placed on ice to keep temperature correct.	Younger than 20	2.13	Between Groups	17.414	5	3.483	2.124	.063
	20-29	2.50	Within Groups	408.288	249	1.640		
	30-39	2.48						
	40-49	2.79						
	50-59	2.50						
	60 or over	3.83						
I often ensure in the back of the house backup items for buffets are labeled and covered properly.	Younger than 20	3.00	Between Groups	35.798	5	7.160	6.849	.000
	20-29	3.46	Within Groups	260.304	249	1.045		
	30-39	3.92						
	40-49	4.25						
	50-59	4.25						
	60 or over	4.50						

Table 5: Tukey Post Hoc Test of Age and Food Handling Knowledge

	Mean Difference	Standard Error	Significance
In my area, food is kept safe during transportation to off-site events.			
Younger than 20 years			
20-29 years	-.35000	.17049	.316
30-39 years	-.68250	.23500	.046
40-49 years	-.52679	.22783	.193
50-59 years	-.81250	.46691	.507
60 & over	-.56250	.39167	.705
I feel that in my area cold food items are properly monitored for temperature.			
Younger than 20 years			
20-29 years	-.04375	.22302	1.00
30-39 years	-.57375	.30741	.425
40-49 years	-.52232	.29802	.498
50-59 years	.90625	.61076	.675
60 & over	.07292	.51234	1.00
I feel checking food temperature can prevent food borne illness.			
Younger than 20 years			
20-29 years	-.41250	.17784	.190
30-39 years	-.78250	.24513	.020
40-49 years	-.95536	.23764	.001
50-59 years	-1.06250	.48702	.250
60 & over	-1.06250	.40855	.101
I ensure chafers are properly lit and functioning before food is placed in them.			
Younger than 20 years			
20-29 years	-1.1875	.25442	.000
30-39 years	-1.40500	.35069	.001
40-49 years	-1.73214	.33998	.000
50-59 years	-1.37500	.69675	.361
60 & over	-1.95833	.58448	.012
I ensure cold food items are always placed on ice to keep temperature correct.			
Younger than 20 years			
20-29 years	-.37500	.24797	.657
30-39 years	-.35500	.34180	.904
40-49 years	-.66071	.33136	.349
50-59 years	-.37500	.67909	.994
60 & over	-1.70833	.56967	.305

I often ensure in the back of the house backup items for buffets are labeled and covered properly.			
Younger than 20 years			
20-29 years	-.46875	.19757	.170
30-39 years	-.92000	.27233	.011
40-49 years	-1.25000	.26401	.000
50-59 years	-1.25000	.54107	.194
60 & over	-1.50000	.45388	.014

A section of the survey asked questions concerned with how often these tasks are performed while working. Table 6 below presents the results. One significant difference was seen in question 20, which asks how often food is maintained about 141 degrees F ($t=-3.131$, $p<.002$). Food that is not properly monitored and placed in cold chafers may not allow the temperature of the food to stay above 141 degrees F. There is a higher chance that food safety can be compromised if proper temperatures are not maintained. Question 17 revealed that managers feel that items are monitored appropriately more so than non-management employees ($t=3.992$, $p<.000$). One explanation for this difference is that managers of their own establishment are more likely to feel their establishment is doing everything correctly. Non-management employees may be more aware of what happens on a daily basis and may come into more direct contact with the food handling in order to make their judgment. The survey pointed out that servers without training stated that they mixed fresh food with food that had been sitting out more so than servers who had received training ($t=-3.394$, $p<.001$). Overall the findings in this section show that management stated that proper procedures are being implemented while non-management employees generally disagree that this is happening. Also with all questions training was found to be significant factor. Those who have had training answered that they were performing correct behaviors and feel that these issues are all important. Table 4 shows a clear gap between management and non-management with respect to the concept of maintaining

correct food temperature. Management believes that food is always maintained above the proper temperature of 141 degrees F while non-management, the group working directly with the food does not believe this is true ($t=4.320, p>.000$). Management knows what the proper temperature should be but they may be depending on the non-management staff to follow through on this critical point. Temperature monitoring may be overlooked as one group is depending on the other to check it. Another reason is due to the high stress nature of catering. Food might be set out in a hurry and stenos are not lit within the proper time period thereby not keeping the food hot enough. There are many instances where setting up can be rushed however, the temperature setting of the food must be monitored and maintained.

Table 6: *t*-test Analysis on Food Handling Frequencies

Frequency of:			Mean	S.D	<i>t</i> -Value	Sig
Monitoring of temperature of cold food	Gender	Male	2.82	1.164	1.820	.070
		Female	2.56	1.144		
	Management	Yes	3.28	1.205	3.992	.000
		No	2.55	1.109		
	Training	Yes	3.32	1.157	5.657	.000
		No	2.45	1.070		
	Status	Part-time	2.40	1.103	-4.546	.000
		Full-time	3.05	1.108		
Removal of food that has been out for too long	Gender	Male	3.92	.896	.783	.435
		Female	3.82	1.093		
	Management	Yes	4.33	.871	3.507	.001
		No	3.77	1.004		
	Training	Yes	4.20	.850	3.325	.001
		No	3.74	1.028		
	Status	Part-time	3.58	.989	-5.695	.000
		Full-time	4.28	.885		
Food placed in chafers before checked and lit	Gender	Male	2.88	1.244	-.017	.986
		Female	2.88	1.243		
	Management	Yes	2.37	1.218	-3.124	.000
		No	2.99	1.221		
	Training	Yes	1.99	1.157	-7.773	.000
		No	3.21	1.102		
	Status	Part-time	2.96	1.296	1.564	.119
		Full-time	2.71	1.125		
Hot food temperature above 141degrees F	Gender	Male	4.05	1.003	-3.131	.002
		Female	4.62	2.040		
	Management	Yes	5.33	3.253	4.320	.000
		No	4.13	.881		
	Training	Yes	4.99	2.682	3.874	.000
		No	4.11	.941		
	Status	Part-time	4.05	.878	-4.541	.000
		Full-time	4.84	2.288		
Temperature is monitored in the back ups of food	Gender	Male	2.64	1.312	-.094	.925
		Female	2.65	1.200		
	Management	Yes	3.57	1.167	5.840	.000
		No	2.44	1.180		
	Training	Yes	3.62	1.152	8.603	.000
		No	2.28	1.085		
	Status	Part-time	2.42	1.241	-3.632	.000
		Full-time	2.99	1.170		
Fresh food is mixed with food that has been out	Gender	Male	2.02	1.230	1.070	.285
		Female	1.88	.921		
	Management	Yes	1.48	.863	-3.329	.000
		No	2.05	1.097		
	Training	Yes	1.58	.755	-3.394	.001
		No	2.09	1.150		
	Status	Part-time	1.99	.986	1.394	.165
		Full-time	1.80	1.096		

A significant gap is indicated on Table 7 with reference to those having training as opposed to those who do not have training when asked about mixing food that has been out and added to fresh food ($F=4.762, p<.000$). Trained individuals know that mixing these foods together would be a food safety issue. The non-trained individual may try to save time in a busy period. They may not know the ramifications of mixing these foods together and how this could lead to cross-contamination or other safety concerns. The disparity in this response shows the importance of training everyone who will be handling the food.

Overall this section found that the younger servers lack knowledge concerning basic food safety practices. This could be due to their educational background and their maturity level. Younger employees may not take their position in this work area as serious as the older employee. Older age groups are more likely to have catering as their career of choice and may take greater pride in their work. The older age groups tend to have more experience and know more basic knowledge about catering. The lack of knowledge demonstrated by the younger age groups shows a need for more training.

Table 7: ANOVA Analysis of Age and Food Handling Frequencies

Frequency of:		Mean		Sum of Squares	d.f.	Mean Square	F	p-value
Monitoring of temperature of cold food	Younger than 20	2.68	Between Groups	12.608	5	2.522	1.910	.093
	20-29	2.57	Within Groups	328.663	249	1.320		
	30-39	2.88						
	40-49	3.21						
	50-59	2.00						
	60 or over	2.67						
Removal of food that has been out for too long	Younger than 20	3.50	Between Groups	11.266	5	2.253	2.297	.046
	20-29	3.84	Within Groups	244.201	249	.981		
	30-39	4.00						
	40-49	4.32						
	50-59	3.50						
	60 or over	4.00						
Food placed in chafers before checked and lit	Younger than 20	3.00	Between Groups	10.737	5	2.147	1.405	.223
	20-29	2.95	Within Groups	380.494	249	1.528		
	30-39	2.84						
	40-49	2.43						
	50-59	3.85						
	60 or over	2.16						
Hot food temperature above 141degrees F	Younger than 20	3.50	Between Groups	30.891	5	6.178	6.750	.000
	20-29	4.23	Within Groups	226.983	249	.915		
	30-39	4.64						
	40-49	4.75						
	50-59	4.25						
	60 or over	4.83						
Temperature monitored in the back of the house	Younger than 20	2.16	Between Groups	32.562	5	6.512	4.435	.001
	20-29	2.58	Within Groups	365.673	249	1.469		
	30-39	2.88						
	40-49	3.46						
	50-59	1.75						
	60 or over	3.00						
Fresh food is mixed with food that has been out	Younger than 20	2.50	Between Groups	25.864	5	5.173	4.762	.000
	20-29	1.98	Within Groups	270.473	249	1.086		
	30-39	1.48						
	40-49	1.50						
	50-59	3.00						
	60 or over	1.67						

Table 8: Tukey Post Hoc Findings of Age and Food Handling Frequencies

	Mean Difference	Standard Error	Significance
Monitoring of temperature of cold food			
Younger than 20 years			
20-29 years	-.73270	.19177	.996
30-39 years	-1.14000	.26434	.989
40-49 years	-.82143	.25627	.486
50-59 years	.00000	.52519	.869
60 or over	-.5000	.44057	1.00
Removal of food that has been out for too long			
Younger than 20 years			
20-29 years	-.34375	.19177	.472
30-39 years	-.50000	.26434	.410
40-49 years	-.82143	.25627	.019
50-59 years	.00000	.52519	1.00
60 or over	-.5000	.44057	.866
Food placed in chafers before checked and lit			
Younger than 20 years			
20-29 years	.04375	.23938	1.00
30-39 years	.16000	.32996	.997
40-49 years	.57143	.31989	.476
50-59 years	-.25000	.65557	.999
60 or over	.83333	.54994	.655
Hot food temperature above 141degrees F			
Younger than 20 years			
20-29 years	-.73270	.18536	.001
30-39 years	-1.14000	.25537	.000
40-49 years	-1.25000	.24757	.000
50-59 years	-.75000	.50736	.678
60 or over	-1.33333	.42561	.024
Temperature monitored in the back of the house			
Younger than 20 years			
20-29 years	-.41875	.23467	.478
30-39 years	-.72375	.32347	.224
40-49 years	-1.30804	.31359	.001
50-59 years	.40625	.64268	.989
60 or over	-.84375	.53912	.622
Fresh food is mixed with food that has been out			
Younger than 20 years			
20-29 years	.52500	.20183	.101

30-39 years	1.02000	.27820	.004
40-49 years	1.00000	.26920	.003
50-59 years	-.50000	.55272	.945
60 or over	.83333	.46366	.469

In Table 9 the results show a statistically significant finding except for question 13 in Tukey post-hoc testing between employees having less than a year of experience to having over 3 years of experience. Survey question 11 which discusses keeping food secure during transportation revealed that employees having over 3 years of experience felt that the food was secure ($F=6.422, p<.002$). The group having 3 years of experience showed a significant difference as opposed to the group of only one year of experience. This can be linked back to the veteran employees learning from all of their experiences and the fact that they have had more training. The next survey question, which asks about cold food items being monitored for temperature showed the same difference in response. The group consisting of 3 years of experience consistently answered correctly more so than the group of one year experience. The next question, which asks if checking food temperatures can prevent food borne illness, showed that those of 3 years experience felt the statement to be true. This group marked the statement to be true with an average of 4.26 of the respondents answering true. Those with one year of experience answered true with an average of 3.64 responding true. Experienced staff members would be more likely to answer this way since they have more experience in the industry and have had more exposure. New employees who have been working less than three years require training in order to prepare them for these specific safety issues.

Table 9: ANOVA Analysis of Experience and Food Handling Knowledge

Item		Mean		Sum of Squares	d.f.	Mean Square	F	p-value
In my area, food is kept safe during transportation to off-site events.	0-1 year	3.59	Between	9.776	2	4.888	6.422	.002
	2-3 years	3.89	Groups					
	3 years & over	4.00	Within	191.808	252	.761		
I feel that in my area cold food items are properly monitored for temperature	0-1 year	2.78	Between	14.376	2	7.188	5.466	.005
	2-3 years	3.05	Groups					
	3 years & over	3.28	Within	331.373	252	1.315		
I feel checking food temperature can prevent food borne illness	0-1 year	4.33	Between	2.125	2	1.063	1.175	.311
	2-3 years	4.40	Groups					
	3 years & over	4.52	Within	227.977	252	.905		
I ensure chafers are properly lit and functioning before food is placed in them.	0-1 year	3.64	Between	22.009	2	11.004	5.966	.003
	2-3 years	4.14	Groups					
	3 years & over	4.26	Within	464.799	252	1.844		
I ensure cold food items are always placed on ice to keep temperature correct.	0-1 year	2.27	Between	23.438	2	11.719	7.341	.001
	2-3 years	2.20	Groups					
	3 years & over	2.87	Within	402.264	252	1.596		
I often ensure in the back of the house backup items for buffets are labeled and covered properly.	0-1 year	3.26	Between	19.651	2	9.826	9.017	.000
	2-3 years	3.80	Groups					
	3 years & over	3.83	Within	274.607	252	1.090		

Table 10: Tukey Post Hoc Results of Experience and Food Handling Knowledge

	Mean Difference	Standard Error	Significance
In my area, food is kept safe during transportation to off-site events.			
0-1years			
2-3 years	-.29279	.16877	.194
3 years & over	-.41643	.11768	.001
I feel that in my area cold food items are properly monitored for temperature			
0-1years			
2-3 years	-.27838	.22183	.422
3 years & over	-.51096	.15468	.003
I feel checking food temperature can prevent food borne illness			
0-1years			
2-3 years	-.07257	.18399	.918
3 years & over	-.19593	.12830	.280
I ensure chafers are properly lit and functioning before food is placed in them.			
0-1years			
2-3 years	-.49684	.26272	.143
3 years & over	-.61566	.18319	.003
I ensure cold food items are always placed on ice to keep temperature correct.			
0-1years			
2-3 years	.07434	.24441	.950
3 years & over	-.59482	.18319	.003
I often ensure in the back of the house backup items for buffets are labeled and covered properly.			
0-1years			
2-3 years	-.53451	.20194	.023
3 years & over	-.59482	.17043	.002

The results of the food handling section with regards to the amount of experience individuals have in catering are presented in Table 11. Significant findings were determined when comparing responses from the employees who have worked up to one year as opposed to those who have worked over 3 years. Survey question 17 which asks if servers feel that cold food items are monitored for proper temperature showed that those with over 3 years of experience feel that temperature is monitored more than those who have less experience. Question 18 which asks if food that has been out too long is removed was answered by servers with over 3 years of experience as a positive and the average of their responses was 4.03. Servers with less experience than three years answered positive with a 3.64 average. It was found that those individuals with less experience answered that temperature is monitored and food does not sit out too long.

The next question asks if food is placed in chafers when they are lit and ready to hold hot food. Significant findings were found between all of the age groups ($F=7.923$ $p<.000$). In the catering industry events can be extremely fast paced and things can fall behind quickly. Chafers may not be prepared and ready for use. The next question asks about how often hot food temperature is maintained above 141 degrees F. It was found that those with over a year of experience felt that the temperature was maintained very often. The servers with more experience will check this more often and continue to maintain the proper temperature because they know the importance of maintaining the correct temperatures of the food. The new employees may not know or understand the importance of the proper temperature settings. There were no significant findings found in the survey question which asked about monitoring food temperature in the back up of food items. The last question in this section asks about mixing fresh food with food that had been sitting out. It was found that newer employees were more

likely to mix these food items.

Table 11: ANOVA Analysis of Experience and Food Handling Frequencies

Frequency of:		Mean		Sum of Squares	d.f.	Mean Square	F	p-value
Monitoring of temperature of cold food	0-1 year	2.39	Between Groups	21.657	2	10.828	8.538	.000
	2-3 years	2.57						
	3 years & over	3.01	Within Groups	319.614	252	1.268		
Removal of food that has been out for too long	0-1 year	3.65	Between Groups	9.890	2	4.945	5.074	.007
	2-3 years	2.43						
	3 years & over	2.68	Within Groups	245.577	252	.975		
Food placed in chafers before checked and lit	0-1 year	3.20	Between Groups	23.145	2	11.573	7.923	.000
	2-3 years	2.43						
	3 years & over	2.69	Within Groups	368.086	252	1.461		
Hot food temperature above 141degrees F	0-1 year	3.99	Between Groups	13.785	2	6.892	7.088	.001
	2-3 years	4.51						
	3 years & over	4.44	Within Groups	244.089	252	.972		
Temperature monitored in the back of the house	0-1 year	2.47	Between Groups	8.625	2	4.313	2.789	.063
	2-3 years	2.57						
	3 years & over	2.86	Within Groups	389.610	252	1.546		
Fresh food is mixed with food that has been out	0-1 year	2.14	Between Groups	13.788	2	6.894	6.149	.002
	2-3 years	1.43						
	3 years & over	1.92	Within Groups	282.549	252	1.121		

Table 12: Tukey Post Hoc Findings of Experience and Food Handling Frequencies

	Mean Difference	Standard Error	Significance
Monitoring of temperature of cold food			
0-1years			
2-3 years	-.17320	.21786	.706
3 years & over	-.62046	.15191	.000
Removal of food that has been out for too long			
0-1years			
2-3 years	-.41113	.19096	.082
3 years & over	-.39137	.13316	.010
Food placed in chafers before checked and lit			
0-1years			
2-3 years	.77497	.23379	.003
3 years & over	.52130	.16303	.004
Hot food temperature above 141F			
0-1years			
2-3 years	-.52321	.19096	.018
3 years & over	-.44818	.13331	.003
Temperature monitored in the back of the house			
0-1years			
2-3 years	-.10240	.24053	.905
3 years & over	-.39079	.16772	.054
Fresh food is mixed with food that has been out			
0-1years			
2-3 years	.71302	.20484	.002
3 years & over	.22571	.14283	.256

Equipment:

The section on Equipment asked respondents about how often proper equipment procedures were completed and how respondents felt about general use and care of equipment.

In regards to management all questions were found to be significant. The two questions that showed significant differences were: " I believe there is no need to check chafers before an event" with management answering with an average of 1.39 and non-management answering with 2.37($t=-5.202, p<.000$). The second question: "I feel that ice can be mixed with raw and cooked foods and be safe for consumption" showed management answering with an average of 1.07 vs. the non-management employees answering with 1.76($t=-3.775, p<.000$). Also with regards to training all questions were found to be significant. Another significant finding was found between the responses of the trained personnel vs. the non-trained personnel as the trained group answered with 1.26 on average and the non-trained group answered with a 1.77 ($t=-3.183, p<.002$).

Table 13 reveals a strong gender disparity in regards to the food safety issue of whether or not it is acceptable to mix ice with raw and cooked foods. More of the male food handlers declare that is acceptable to mix the ice with the raw and cooked foods while the females feel this practice is incorrect ($t=1.966, p<.050$). It is a basic fact of food safety to never mix anything raw with anything that is cooked, especially ice.

Table 13 also shows a major gap in respect to the question concerning mixing raw and cooked foods with ice. Responses given in Table 13 show a disparity with respect to the management belief and/or non-management belief in whether or not this is an acceptable practice. Non-management believes that this is an acceptable practice more so than management ($t=-3.775, p<.000$). Another interesting find was that management felt there was no need to check chafers before an event, while non-management felt it was an important task to complete ($t=-5.202, p<.000$) . Management may feel that the servers would check and clean the chafers when cleaning up after an event and then would be able to identify any issues with the chafers.

Proper food safety practices would account that management check that all equipment is working correctly since the responsibility ultimately rests on them. As seen from the previous section, there are also major differences with regards to training and/or lack of training. Those who have received training answered more items correctly than those who have not been trained.

Differences were found between status, management, and training. Once again there appears to be a gap between employees who have training and those who do not have formal training. This section shows a difference with equipment use among the responses given by the part-time group vs. the full-time group of employees along with differences between males and females.

The analysis shows that employees with full-time status also feel that chafers need to be checked before events more so than part-time employees ($t=5.531, p<.000$). Again it can be emphasized that full-time employees have more experience and know from their training the correct use of equipment and procedures in contrast to the part-time group.

Table 13: *t*-test Analysis on Equipment

Item			Mean	S.D	<i>t</i> -Value	Sig
I feel that chafers are cleaned after each use in my area.	Gender	Male	3.63	1.194	1.028	.305
		Female	3.47	1.247		
	Management	Yes	3.85	1.210	1.841	.067
		No	3.48	1.217		
	Training	Yes	3.91	1.292	2.941	.004
		No	3.41	1.170		
Status	Part-time	3.42	1.257	-1.968	.050	
	Full-time	3.73	1.165			
I feel it is important to ensure glassware is free of chips.	Gender	Male	4.06	.965	-1.034	.302
		Female	4.18	.936		
	Management	Yes	4.33	.896	1.618	.107
		No	4.08	.958		
	Training	Yes	4.35	.921	2.337	.020
		No	4.04	.949		
Status	Part-time	4.09	.919	-1.042	.298	
	Full-time	4.22	.955			
I believe there is no need to check chafers before an event.	Gender	Male	2.16	1.164	-.506	.613
		Female	2.23	1.267		
	Management	Yes	1.39	.954	-5.202	.000
		No	2.37	1.199		
	Training	Yes	1.52	1.066	-5.715	.000
		No	2.45	1.176		
Status	Part-time	2.52	1.216	5.531	.000	
	Full-time	1.70	1.054			
I feel you should only work with food at an off-site event when there is coverage overhead.	Gender	Male	3.28	1.268	-1.769	.078
		Female	3.55	1.171		
	Management	Yes	3.74	1.290	1.968	.050
		No	3.35	1.200		
	Training	Yes	3.88	1.278	3.789	.000
		No	3.25	1.159		
Status	Part-time	3.38	1.243	-.778	.437	
	Full-time	3.50	1.154			
I feel that ice can be mixed with raw and cooked foods and be safe for consumption.	Gender	Male	1.78	1.256	1.966	.050
		Female	1.50	1.034		
	Management	Yes	1.07	.250	-3.775	.000
		No	1.76	1.234		
	Training	Yes	1.26	.678	-3.183	.002
		No	1.77	1.259		
Status	Part-time	1.67	1.094	1.140	.255	
	Full-time	1.50	1.154			

Results shown in Table 14 found difference between the separate age groups with regards to questions concerning equipment. Survey question 35 which asks if chafers are cleaned after

each use, shows that there were significant differences ($F=4.954, p<.000$) from the responses of the younger than 20 age group compared to the 30 to 40 year old groups. Post hoc tests also found a gap between the 20 age group and the thirty-year-old group response to question 35. It was found that the older age groups felt that chafers were cleaned more so than the younger groups. Question 36 which asks respondents about ensuring glassware is free of chips also showed gaps in the responses given from the two separate age groups. Post hoc tests show differences between the younger than 20 group and the 20 to 30 year old age groups. Although question 37 found a significant difference between the age groups, the post hoc tests did not show a difference between the two age groups. The differences in opinion with respect to this question could be attributed to the lack of training of the younger age group and/or the greater amount of knowledge the older group has gained over their careers in the catering field. The results show that more attention needs to be focused on the younger employee since they would probably be the newly hired employee.

Table 14: ANOVA Analysis of Age and Equipment Knowledge

Item		Mean		Sum of Squares	d.f.	Mean Square	F	p-value
I feel that chafers are cleaned after each use in my area.	Younger than 20	3.06	Between Groups	34.304	5	6.881	4.954	.000
	20-29	3.43	Within Groups	344.833	249	1.385		
	30-39	4.40						
	40-49	3.96						
	50-59	3.25						
	60 or over	4.00						
I feel it is important to ensure glassware is free of chips.	Younger than 20	3.66	Between Groups	13.811	5	2.762	3.193	.008
	20-29	4.19	Within Groups	215.420	249	.865		
	30-39	4.44						
	40-49	3.96						
	50-59	4.75						
	60 or over	3.67						
I believe there is no need to check chafers before an event.	Younger than 20	2.65	Between Groups	20.120	5	4.024	2.814	.017
	20-29	2.25	Within Groups	356.076	249	1.430		
	30-39	1.76						
	40-49	2.03						
	50-59	1.00						
	60 or over	1.67						
I feel you should only work with food at an off-site event when there is coverage overhead.	Younger than 20	2.90	Between Groups	15.306	5	3.061	2.090	.067
	20-29	3.46	Within Groups	364.796	249	1.465		
	30-39	3.28						
	40-49	3.64						
	50-59	4.00						
	60 or over	4.17						
I feel that ice can be mixed with raw and cooked foods and be safe for consumption.	Younger than 20	2.21	Between Groups	19.448	5	3.890	3.047	.011
	20-29	1.62	Within Groups	317.901	249	1.277		
	30-39	1.64						
	40-49	3.06						
	50-59	1.14						
	60 or over	1.00						
		1.50						

Table 15: Tukey Post Hoc Findings of Age and Equipment Knowledge

	Mean Difference	Standard Error	Significance
I feel that chafers are cleaned after each use in my area.			
Younger than 20			
20-29 years	-.36875	.22789	.587
30-39 years	-1.33750	.31412	.000
40-49 years	-.90179	.30453	.039
50-59 years	-.18750	.62410	1.00
60 or over	-.93750	.52354	.474
I feel it is important to ensure glassware is free of chips.			
Younger than 20			
20-29 years	-.53750	.18012	.037
30-39 years	-.24625	.20003	.022
40-49 years	.22946	.19054	.796
50-59 years	-.55625	.47084	.233
60 or over	.52708	.38678	1.00
I believe there is no need to check chafers before an event.			
Younger than 20			
20-29 years	-1.33750	.31412	.000
30-39 years	-.90179	.30453	.039
40-49 years	.62054	.30945	.952
50-59 years	-.96875	.25308	.002
60 or over	-.98958	.53200	.429
I feel you should only work with food at an off-site event when there is coverage overhead.			
Younger than 20			
20-29 years	-.53750	.18012	.037
30-39 years	-.78375	.24828	.022
40-49 years	-.73661	.31322	.178
50-59 years	-1.09375	.36191	.530
60 or over	-1.026742	.53848	.184
I feel that ice can be mixed with raw and cooked foods and be safe for consumption.			
Younger than 20			
20-29 years	-.60000	.21881	.071
30-39 years	-.57875	.30161	.393
40-49 years	1.07589	.29239	.004
50-59 years	1.21875	.59923	.326

60 or over	.71875	.50268	.709
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Table 16 presents the results pertaining to equipment frequencies. Although not significant, it was found that females on average felt utensils were cleaned and checked and that hot holding devices were properly functioning more so than the males. It was found that those who have had training clean utensils after each use more often than those who lack training ($t=5.498, p<.000$). Management stated that utensils were cleaned after each use more so that non-management respondents which was also found to be of significance.

Table 16: *t*-test Analysis on Equipment Frequencies

Frequency of:	Gender	Mean	S.D.	<i>t</i>-Value	Sig.
Cleaning of Utensils	Male	4.16	1.023	-.658	.511
	Female	4.25	1.018		
Hot holding devices checked for temperature	Male	4.09	1.378	1.376	.170
	Female	4.22	1.971		
No hand washing facility available	Male	2.52	1.016	-.554	.580
	Female	1.70	.991		
Management	Yes	4.63	.799	3.160	.002
Cleaning of Utensils	No	4.11	1.041		
Hot holding devices checked for temperature	Yes	3.54	1.425	5.080	.000
	No	2.44	1.709		
No hand washing facility available	Yes	1.70	1.113	-2.385	.018
	No	2.08	.965		
Training	Yes	4.75	.434	5.498	.000
Cleaning of Utensils	No	4.01	1.098		
Hot holding devices checked for temperature	Yes	3.65	2.381	6.776	.000
	No	2.26	1.190		
No hand washing facility available	Yes	2.01	1.022	.026	.979
	No	2.01	.997		
Cleaning of Utensils	Part-time	4.16	.939	-1.564	.119
	Full-time	4.36	1.045		
Hot holding devices checked for temperature	Part-time	2.52	1.907	-2.096	.037
	Full-time	2.85	1.374		
No hand washing facility available	Part-time	2.07	1.001	1.100	.272
	Full-time	1.93	1.012		

Significant differences indicated in Table 17 were found in questions about checking hot holding devices ($F=3.254, p<.007$) and addressing hand washing if there is not a hand washing facility available off-site ($F=3.420, p<.005$). It was found in post hoc testing that the 30 year old age group and 40 year old age group did check on the holding devices at times, however the younger age groups rated this question as checking temperature rarely and/or never. Post-hoc analyses showed significance for the following age groups: “younger than 20 years”, “20-29 years”, and “30-39 years” at the .05 significance level. The younger age groups answered that sometimes there is no hand washing facility available for them. The 30 to 40 age group answered that there is never a hand washing facility available for them at off-site events.

Table 17: ANOVA Analysis of Age and Equipment Frequencies

Frequency of:		Mean		Sum of Squares	d.f.	Mean Square	<i>F</i>	<i>p</i> -value
Cleaning of Utensils	Younger than 20	3.88	Between Groups	9.140	5	1.828	1.786	.116
	20-29	4.24	Within Groups	254.844	249	1.023		
	30-39	4.44						
	40-49	4.32						
	50-59	3.25						
	60 or over	4.17						
Hot holding devices checked for temperature	Younger than 20	2.44	Between Groups	32.554	5	6.511	3.254	.007
	20-29	2.44	Within Groups	498.230	249	2.001		
	30-39	3.28						
	40-49	3.07						
	50-59	1.75						
	60 or over	3.67						
No hand washing facility available	Younger than 20	2.41	Between Groups	16.384	5	3.277	3.420	.005
	20-29	2.05	Within Groups	238.581	249	.958		
	30-39	1.40						
	40-49	1.85						
	50-59	2.50						
	60 or over	1.83						

Table 18: Tukey Post Hoc Findings of Age and Equipment Frequencies

	Mean Difference	Standard Error	Significance
Cleaning of Utensils			
Younger than 20			
20-29 years	-.36875	.19591	.416
30-39 years	-.56500	.27004	.295
40-49 years	-.44643	.26179	.530
50-59 years	.62500	.53652	.853
60 or over	-.29167	.45007	.987
Hot holding devices checked for temperature			
Younger than 20			
20-29 years	.35625	.18955	.512
30-39 years	1.00625	.26128	.247
40-49 years	.54911	.25330	.995
50-59 years	-.09375	.51912	.502
60 or over	.57292	.43547	.937
No hand washing facility available			
Younger than 20			
20-29 years	.35625	.18955	.417
30-39 years	1.00625	.26128	.002
40-49 years	.54911	.25330	.257
50-59 years	-.09375	.51912	1.00
60 or over	.57292	.43547	.776
20-29 years			
30-39 years	.65000	.21051	.027

Significant findings were found in Table 19 with regards to employees with over 3 years of experience with their responses concerning if they feel that chafers are cleaned after each use ($F=5.799, p<.003$). The positive response by this group can be attributed to their commitment to work and their personal standards of professionalism. It is important to have chafers cleaned because food sitting out on these pieces can breed large amounts of bacteria which in turn can be passed on to other food when the chafer is used again. The employees with over 3 years of experience also scored positive with the statement about checking the chafers before the event ($F=3.984, p<.020$). This was also found to be significant in the Tukey Post-hoc tests. The buddy

system could be utilized by teaming individuals with over 3 years of experience with younger and less experienced employees in order for the newer individuals to learn important techniques and procedures. Teaming also helps managers save money on certifying all employees. Certifying veteran employees who may be staying with a company for extended time is a good strategy. In addition the veterans who are certified can then help and teach the new employees.

Table 19: ANOVA Analysis of Experience and Equipment Knowledge

Item		Mean		Sum of Squares	d.f	Mean Square	F	p-value
I feel that chafers are cleaned after each use in my area.	0-1 years	3.26	Between	16.680	2	8.340	5.799	.003
	2-3 years	3.68	Groups					
	3 & over years	3.80	Within	362.457	252	1.438		
I feel it is important to ensure glassware is free of chips.	0-1 years	4.00	Between	6.320	2	3.160	3.573	.030
	2-3 years	4.49	Groups					
	3 & over years	4.13	Within	222.911	252	.885		
I believe there is no need to check chafers before an event.	0-1 years	2.42	Between	11.530	2	5.765	3.984	.020
	2-3 years	1.82	Groups					
	3 & over years	2.08	Within	364.666	252	1.447		
I feel you should only work with food at an off-site event when there is coverage overhead.	0-1 years	3.39	Between	.274	2	.137	.091	.913
	2-3 years	3.40	Groups					
	3 & over years	3.46	Within	379.828	252	1.507		
I feel that ice can be mixed with raw and cooked foods and be safe for consumption.	0-1 years	1.66	Between	4.155	2	2.078	1.571	.210
	2-3 years	1.31	Groups					
	3 & over years	1.70	Within	333.194	252	1.322		

Table 20: Tukey Post Hoc Results of Experience and Equipment Knowledge

	Mean Difference	Standard Error	Significance
I feel that chafers are cleaned after each use in my area.			
0-1 years			
2-3 years	-.42023	.23200	.168
3 years & over	-.53825	.16177	.003
I feel it is important to ensure glassware is free of chips.			
0-1 years			
2-3 years	-.48571	.18194	.022
3 years & over	-.13084	.12687	.558
I believe there is no need to check chafers before an event.			
0-1 years			
2-3 years	.58736	.23270	.033
3 years & over	.33182	.16227	.104
I feel you should only work with food at an off-site event when there is coverage overhead.			
0-1 years			
2-3 years	-.01062	.23749	.999
3 years & over	-.06856	.16561	.910
I feel that ice can be mixed with raw and cooked foods and be safe for consumption.			
0-1 years			
2-3 years	.34943	.22244	.260
3 years & over	-.03722	.15511	.969

Table 21: ANOVA Analysis of Experience and Equipment Frequencies

Frequency of:		Mean		Sum of Squares	d.f.	Mean Square	F	p-value
Cleaning of Utensils	0-1 years	4.02	Between	7.344	2	3.672	3.605	.029
	2-3 years	4.37	Groups					
	3 & over years	4.35	Within	256.641	252	1.018		
Hot holding devices checked for temperature	0-1 years	2.38	Between	12.679	2	6.339	3.083	.048
	2-3 years	2.57	Groups					
	3 & over years	2.85	Within	518.106	252	2.056		
No hand washing facility available	0-1 years	2.23	Between	10.384	2	5.192	5.349	.005
	2-3 years	1.71	Groups					
	3 & over years	1.88	Within	244.581	252	.971		

Table: 22 Tukey Post Hoc Findings of Experience and Equipment Frequencies

	Mean Difference	Standard Error	Significance
Cleaning of Utensils			
0-1 years			
2-3 years	-.35373	.19522	.168
3 years & over	-.33744	.13613	.037
Hot holding devices checked for temperature			
0-1 years			
2-3 years	-.19090	.27737	.771
3 years & over	-.47928	.19341	.037
No hand washing facility available			
0-1 years			
2-3 years	.51580	.19058	.020
3 years & over	.35158	.13289	.023

Personal Hygiene:

With regard to the results from the personal hygiene portion of the survey, there was a significant difference noted between those employees who worked full time compared to those who work part-time when asked if they wash their hands from returning from a break ($t=-4.458$, $p<.000$). Perhaps the part-time employees are not following this practice because this position is

not their career of choice or they are not concerned about following the strict standards and rules of the job description. There may not be as much guidance overseeing these individuals or the guidance may only come in critical times when absolutely necessary. The findings showed no significant difference that training has an effect on washing hands from returning from a break ($t=.258, p<.796$). However, the mean was slightly higher for those who did have training. The findings also showed that management practices washing their hands more frequently after a break when compared to non-management ($t=2.715, p<.007$). The data draws attention to this critical area of concern and points out that management needs to keep a close eye on employees with respect to hand washing. Personal hygiene is a major area of concern in the food industry and proper practices must take place.

Table 23: *t*-test Analysis of Personal Hygiene Frequencies

Frequency of:			Mean	S.D.	<i>t</i> -Value	Sig.
Hand washing when returning from a break.	Gender	Male	4.33	.922	-.427	.670
		Female	4.38	.876		
	Management	Yes	4.67	.762	2.715	.007
		No	4.28	.910		
	Training	Yes	4.38	.806	.258	.796
		No	4.34	.930		
	Status	Part-time	4.18	.932	-4.458	.000
		Full-time	4.66	.697		
Hand washing when touching your face or hair.	Gender	Male	3.16	1.188	-.271	.786
		Female	3.20	1.113		
	Management	Yes	3.76	1.099	3.867	.000
		No	3.06	1.121		
	Training	Yes	3.58	1.049	3.422	.001
		No	3.04	1.150		
	Status	Part-time	3.05	1.157	-2.179	.030
		Full-time	3.37	1.120		

Differences in responses based on gender were noted (see Table 23). The male respondents scored higher than the female respondents with respect to the statement concerning

if there is a need to be reminded to wash hands ($t=-4.915, p<.000$). This was a surprising find as our society might expect the female to be more conscientious in personal hygiene than males.

It was found that managers feel that servers do need to be reminded to wash their hands after clearing dirty dishes. This shows that even with training servers still need to be reminded to properly wash their hands after dealing with dirty dishware. It was also found that non-managerial workers feel that it is slightly acceptable to eat and drink in the back of the off-site facility. It is not surprising that management answered that this should never happen. However, servers do eat and drink in the back of off-site establishments. This is a serious issue and is against the health code. The non-management respondents felt that jewelry does not affect the safety of food. Rings and bracelets should not be worn while working with food or when serving food to others. Management answered on average of 1.59 and non-management answered on average with a 2.8 on the jewelry question ($t=5.881, p<.003$). Significant findings in regards to training were seen in several questions. Trained personnel did not agree with the statement about eating or drinking in the back of the house ($t=-3.092, p<.002$). Trained employees also agreed with having a clean uniform ($t=5.137, p<.000$). Status of employment was seen to be significant in question 29 and 31, which asked about eating and drinking in the back of the house ($t =3.856, p<.000$) and about drying hands on their uniform ($t=4.455, p<.000$).

Table 24: *t*-test Analysis of Personal Hygiene Knowledge

Item			Mean	S.D	<i>t</i> -Value	Sig
I firmly believe that I should wash my hands every time I serve food.	Gender	Male	4.2459	.95616	.968	.334
		Female	4.1278	.98791		
	Management	Yes	4.0870	1.00722	-.749	.454
		No	4.2057	.96614		
	Training	Yes	4.1304	.99872	-.538	.591
		No	4.2043	.96489		
	Status	Part-time	4.1457	.96883	-1.069	.286
		Full-time	4.2772	.93935		
I think there is a need to be reminded after clearing dirty plates and silverware to wash hands before serving food again.	Gender	Male	3.3361	1.20337	-4.915	.000
		Female	4.0150	.99989		
	Management	Yes	3.8478	1.36573	1.026	.306
		No	3.6555	1.09894		
	Training	Yes	3.8551	1.12819	1.396	.164
		No	3.6290	1.15642		
	Status	Part-time	3.6159	1.17110	-1.402	.162
		Full-time	3.8218	1.09905		
I think that the temperature of water should be at least warm for proper hand washing.	Gender	Male	3.7541	1.05479	-.197	.844
		Female	3.7820	1.18921		
	Management	Yes	3.6957	1.19014	-.485	.628
		No	3.7847	1.11224		
	Training	Yes	3.6812	1.11794	-.756	.451
		No	3.8011	1.12860		
	Status	Part-time	3.8013	1.18895	.540	.590
		Full-time	3.7228	1.04037		
I think there should always be a hand washing facility available at off-site events.	Gender	Male	4.0246	1.19547	-.811	.418
		Female	4.1353	.98305		
	Management	Yes	4.0000	1.15470	-.566	.572
		No	4.1005	1.07616		
	Training	Yes	4.0580	.98345	-.217	.828
		No	4.0914	1.12813		
	Status	Part-time	4.0464	1.10356	-1.027	.305
		Full-time	4.1881	1.02677		
I believe that coming to work in a dirty uniform will affect food safety.	Gender	Male	3.2705	1.31134	-2.488	.013
		Female	3.6767	1.29421		
	Management	Yes	3.6957	1.22691	1.216	.225
		No	3.4354	1.33261		
	Training	Yes	4.1449	1.12819	5.137	.000
		No	3.2366	1.29780		
	Status	Part-time	3.5695	1.36387	.919	.359
		Full-time	3.4158	1.20223		
I feel if I am sick I will not affect a guest's chance of becoming ill while I am at work.	Gender	Male	1.6311	.94651	-1.492	.137
		Female	1.8496	1.33992		
	Management	Yes	1.3696	1.08236	-2.425	.016

		No	1.8278	1.17629		
	Training	Yes	1.4783	1.18332	-2.233	.026
		No	1.8441	1.15426		
	Status	Part-time	1.8742	1.25062	2.345	.020
		Full-time	1.5248	1.00592		
I feel that eating or drinking in the back of the house does not affect the safety of food in my area.	Gender	Male	2.5328	1.31855	.221	.826
		Female	2.4962	1.32359		
	Management	Yes	1.5870	1.08681	-5.567	.000
		No	2.7177	1.27917		
	Training	Yes	2.1014	1.31892	-3.092	.002
		No	2.6667	1.28890		
	Status	Part-time	2.7682	1.23528	3.856	.000
		Full-time	2.1287	1.36867		
I feel single use gloves should be worn at all times when preparing food.	Gender	Male	3.0820	1.28944	-.563	.574
		Female	3.1654	1.07436		
	Management	Yes	3.4348	1.22297	1.974	.348
		No	3.0574	1.16295		
	Training	Yes	3.4203	1.15562	2.453	.015
		No	2.6667	1.28890		
	Status	Part-time	3.0662	1.21474	-1.060	.049
		Full-time	3.642277	1.13913		
I feel it is acceptable if I dry my hands on my uniform after washing them.	Gender	Male	2.0492	.95218	-1.518	.130
		Female	2.2481	1.12416		
	Management	Yes	1.5870	1.14651	-4.174	.511
		No	2.2775	.98524		
	Training	Yes	1.6667	1.05254	-4.696	.000
		No	2.3333	.99004		
	Status	Part-time	2.3642	1.04870	4.455	.000
		Full-time	3.642277	1.13913		
I don't believe that jewelry affects the safety of food.	Gender	Male	2.5000	1.36212	-1.035	.794
		Female	2.6767	1.36264		
	Management	Yes	1.5870	1.10707	-5.881	.003
		No	2.8134	1.31508		
	Training	Yes	2.0870	1.35841	-3.695	.512
		No	2.7796	1.31922		
	Status	Part-time	2.8940	1.29693	4.667	.389
		Full-time	2.1089	1.32590		

The results of the study pertaining to personal hygiene and age are given in Table 25.

Several significant findings were seen in survey questions 23, 24, 26, 27, 30, 31, and 32.

Question 23 asks if respondents firmly believe they should wash their hands every time they

serve food. Post-hoc tests show that major differences occurred between the age groups of the 20 to 30 year old group and also the 30 to 60 and over age group. A difference was seen in survey question 24 which asks if they feel there is a need to be reminded of hand washing. Post-hoc tests reveal a notable difference between the younger than 20 group and the 30 year old age group.

Survey question 26 asks if there needs to be a hand washing facility at off-site events. Management must provide a hand washing facility at an off-site location in observance of standard law. The results show that the 30-year-old age group agreed with this statement more than the 60 and over age group.

Survey question 27 which is about the cleanliness of a uniform also showed a statistically significant finding ($F=3.885, p<.002$). This question showed differences between the age groups of younger than 20 and the 30 to 20-year-old group. The older age groups felt that a dirty uniform would affect food safety more than the younger than 20 age group. Lack of knowledge or a lack of professionalism may be why the younger group answered this way. The next question which refers to the drying of hands on a uniform found that the 60 and older group disagreed with the statement more than the younger group ($F=3.323, p<.006$). It is unacceptable for a server to dry their hands on their uniform. The uniform can contain bacteria which could be passed through the food. The final question discusses jewelry and food safety. It was found that the younger than 20 groups differed from the 30, 50, and 60 and older age group. The younger age group did not feel that jewelry would affect food safety when indeed it does.

Table 25: ANOVA Analysis of Age and Personal Hygiene Knowledge

Item		Mean		Sum of Squares	d.f.	Mean Square	F	p-value
I firmly believe that I should wash my hands every time I serve food.	Younger than 20	4.31	Between Groups	13.744	5	2.749	3.021	.011
	20-29	4.08	Within Groups	226.593	249	.910		
	30-39	4.76						
	40-49	4.28						
	50-59	4.00						
	60 or over	3.50						
I think there is a need to be reminded after clearing dirty plates and silverware to wash hands before serving food again.	Younger than 20	3.28	Between Groups	18.181	5	3.636	2.844	.016
	20-29	3.68	Within Groups	318.344	249	1.278		
	30-39	4.24						
	40-49	3.82						
	50-59	4.00						
	60 or over	2.83						
I think that the temperature of water should be at least warm for proper hand washing.	Younger than 20	3.81	Between Groups	4.519	5	.904	.710	.616
	20-29	3.68	Within Groups	316.830	249	1.272		
	30-39	4.12						
	40-49	3.82						
	50-59	4.00						
	60 or over	3.83						
I think there should always be a hand washing facility available at off-site events.	Younger than 20	3.87	Between Groups	30.705	5	6.141	3.317	.006
	20-29	4.01	Within Groups	460.997	249	1.851		
	30-39	4.84						
	40-49	4.39						
	50-59	3.75						
	60 or over	2.66						
I believe that coming to work in a dirty uniform will affect food safety	Younger than 20	2.71	Between Groups	31.820	5	6.364	3.885	.002
	20-29	3.63	Within Groups	407.850	249	1.638		
	30-39	3.92						
	40-49	3.21						
	50-59	3.75						
	60 or over	2.83						
I feel if I am sick I will not affect a guest's chance of becoming ill while I am at work.	Younger than 20	2.15	Between Groups	11.661	5	2.332	1.724	.130
	20-29	1.72	Within Groups	336.771	249	1.352		
	30-39	1.88						
	40-49	1.39						
	50-59	1.00						
	60 or over	1.67						
I feel that eating or drinking in the back of the house does not affect the safety of food in my area.	Younger than 20	2.53	Between Groups	8.918	5	1.784	1.026	.403
	20-29	2.61	Within Groups	432.784	249	1.783		
	30-39	2.08						
	40-49	2.50						
	50-59	2.00						
	60 or over	2.00						

I feel single use gloves should be worn at all times when preparing food.	Younger than 20	2.71	Between Groups	17.983	5	3.597	2.665	.023
	20-29	3.23	Within Groups	336.001	249	1.349		
	30-39	2.56						
	40-49	3.35						
	50-59	3.50						
	60 or over	3.50						
I feel it is acceptable if I dry my hands on my uniform after washing them.	Younger than 20	2.43	Between Groups	17.983	5	3.491	3.323	.006
	20-29	2.24	Within Groups	261.579	249	1.051		
	30-39	1.96						
	40-49	1.75						
	50-59	2.00						
	60 or over	1.00						
I don't believe that jewelry affects the safety of food.	Younger than 20	3.06	Between Groups	40.462	5	8.092	4.674	.000
	20-29	2.71	Within Groups	431.122	249	1.731		
	30-39	2.04						
	40-49	2.39						
	50-59	1.00						
	60 or over	1.17						

Table 26: Tukey Post Hoc Findings of Age and Personal Hygiene Knowledge

	Mean Difference	Standard Error	Significance
I firmly believe that I should wash my hands every time I serve food.			
Younger than 20			
20-29 years	-.23125	.18473	.811
30-39 years	-.44750	.25463	.495
40-49 years	.02679	.24686	1.00
50-59 years	.31250	.50591	.990
60 or over	.81250	.42439	.396
I think there is a need to be reminded after clearing dirty plates and silverware to wash hands before serving food again.			
Younger than 20			
20-29 years	-.40625	.21896	.432
30-39 years	-.95875	.30182	.021
40-49 years	-.54018	.29260	.438
50-59 years	-.71875	.59965	.837
60 or over	.44792	.50303	.949
I think that the temperature of water should be at least warm for proper hand washing.			
Younger than 20			
20-29 years	.12500	.21844	.993
30-39 years	-.30750	.30110	.991
40-49 years	-.00893	.29190	1.00
50-59 years	-.18750	.59822	1.00
60 or over	-.02083	.50183	1.00
I think there should always			

be a hand washing facility available at off-site events.			
Younger than 20			
20-29 years	-.13750	20150	.984
30-39 years	-.96500	.27775	.008
40-49 years	-.51786	.26926	.390
50-59 years	.12500	.55183	1.00
60 or over	1.20833	.46291	.099
I believe that coming to work in a dirty uniform will affect food safety			
Younger than 20			
20-29 years	-.91250	.24784	.004
30-39 years	-1.20125	.34162	.007
40-49 years	-.49554	.33119	.667
50-59 years	-1.03125	.34162	.652
60 or over	-.41158	.56937	1.00
I feel if I am sick I will not affect a guest's chance of becoming ill while I am at work.			
Younger than 20			
20-29 years	.43125	.22521	.395
30-39 years	.27625	.31043	.949
40-49 years	.76339	.30095	.118
50-59 years	1.15625	.61676	.420
60 or over	.48958	.51738	.934
I feel that eating or drinking in the back of the house does not affect the safety of food in my area			
Younger than 20			
20-29 years	-.08125	.25530	1.00
30-39 years	.45125	.35191	.795
40-49 years	.03125	.34116	1.00
50-59 years	.53125	.69917	.974
60 or over	.53125	.58651	.945
I feel single use gloves should be worn at all times when preparing food.			
Younger than 20			
20-29 years	-.51250	.22495	.207
30-39 years	.15875	.31007	.996
40-49 years	-.63839	.30060	.278
50-59 years	-.78125	.61650	.802
60 or over	-.78125	.51679	.657
I feel it is acceptable if I dry my hands on my uniform after washing them.			
Younger than 20			
20-29 years	.19375	.19848	.925
30-39 years	.47750	.27359	.503
40-49 years	.68750	.26523	.103
50-59 years	.43750	.54356	.996
60 or over	1.43750	.45598	.022
I don't believe that jewelry affects the safety of food.			
Younger than 20			
20-29 years	.35000	.25481	.743
30-39 years	1.02250	.35123	.045
40-49 years	.66964	.34050	.365
50-59 years	2.06250	.69783	.040

60 or over	1.89583	.58538	.017
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It was found from Table 27 that the younger than 20 age group answered that they sometimes wash their hands when returning back to work ($F=4.584, p<.001$). The older age groups responded that they wash their hands very often. The differences found between these two age groups with response to hand washing frequency maybe a result of immaturity or a perception that hand washing is not that important. Again proper training is critical to make all employees conscious of proper hygiene.

Table 27: ANOVA Analysis of Age and Personal Hygiene Frequencies

Frequency of:		Mean		Sum of Squares	d.f.	Mean Square	F	p-value
Hand washing when returning from a break.	Younger than 20	3.72	Between Groups	17.216	5	3.443	4.584	.001
	20-29	4.42	Within Groups	187.020	249	.751		
	30-39	4.60						
	40-49	4.57						
	50-59	4.25						
	60 or over	4.00						
Hand washing after touching face or Hair	Younger than 20	2.88	Between Groups	19.378	5	2.333	1.800	.113
	20-29	3.20	Within Groups	165.786	249	1.296		
	30-39	3.52						
	40-49	3.25						
	50-59	3.75						
	60 or over	2.33						

Table 28: Tukey Post Hoc Test Findings of Age and Personal Hygiene Frequencies

	Mean Difference	Standard Error	Significance
Hand washing when returning from a break.			
Younger than 20			
20-29 years	-.70000	.16783	.001
30-39 years	-.88125	.23133	.002
40-49 years	-.85268	.22427	.002
50-59 years	-.53125	.45961	.857
60 or over	-.28125	.38555	.978
Hand washing after touching face or Hair			
Younger than 20			
20-29 years	-.32500	.22044	.681
30-39 years	-.64500	.30386	.279
40-49 years	-.37500	.29458	.799
50-59 years	-.87500	.60371	.697
60 or over	.54167	.50643	.893

Overall this section found that the younger servers lack knowledge concerning basic food safety practices. This could be due to their educational background and their maturity level. Younger employees may not take their position in this work area as serious as the older employee. Older age groups are more likely to have catering as their career of choice and may take greater pride in their work. The older age groups tend to have more experience and know more basic knowledge about catering. The lack of knowledge demonstrated by the younger age groups shows a need for more training.

As shown in Table 29, employees were asked if they believe they should wash their hands before serving food. Employees in the 2 to 3 years of experience category scored high on this question ($F=6.690, p<.001$). Employees with less than one year experience scored lower on this question. The more experience in the industry the more employees know about the importance of hand washing. This question was followed by asking if employees felt there was a

need to be reminded to have their hands washed. Employees in the 2 to 3 year range scored higher ($F=11.406, p<.000$). Employees may forget to wash their hands and need constant reminders. Employees may become so busy that they purposely do not follow through on correct procedures.

Table 29: ANOVA Analysis of Experience and Personal Hygiene Knowledge

Item		Mean		Sum of Squares	d.f.	Mean Square	F	p-value
I firmly believe that I should wash my hands every time I serve food.	0-2 years	4.04	Between	12.117	2	6.058	6.690	.001
	2-3 years	4.71	Groups					
	3 & over years	4.16	Within	228.221	252	.906		
I think there is a need to be reminded after clearing dirty plates and silverware to wash hands before serving food again.	0-1 years	3.35	Between	27.934	2	13.967	11.406	.000
	2-3 years	4.58	Groups					
	3 & over years	3.85	Within	308.591	252	1.225		
I think that the temperature of water should be at least warm for proper hand washing.	0-1 years	3.58	Between	6.947	2	3.473	2.784	.064
	2-3 years	3.94	Groups					
	3 & over years	3.90	Within	314.402	252	1.248		
I think there should always be a hand washing facility available at off-site events.	0-1 years	3.95	Between	4.900	2	2.450	2.083	.127
	2-3 years	4.37	Groups					
	3 & over years	4.12	Within	296.371	252	1.176		
I believe that coming to work in a dirty uniform will affect food safety	0-1 years	3.38	Between	9.757	2	4.879	2.860	.059
	2-3 years	3.97	Groups					
	3 & over years	3.42	Within	429.913	252	1.706		
I feel if I am sick I will not affect a guest's chance of becoming ill while I am at work.	0-1 years	1.66	Between	1.448	2	.724	.526	.592
	2-3 years	1.86	Groups					
	3 & over years	1.79	Within	346.984	252	1.377		
I feel that eating or drinking in the back of the house does not affect the safety of food in my area.	0-1 years	2.58	Between	1.172	2	.586	.335	.715
	2-3 years	2.37	Groups					
	3 & over years	2.50	Within	440.530	252	1.748		
I feel single use gloves should be worn at all times when preparing food.	0-1 years	3.10	Between	1.896	2	.948	.679	.508
	2-3 years	2.94	Groups					
	3 & over years	3.21	Within	352.088	252	1.397		
I feel it is acceptable if I dry my hands on my uniform after washing them.	0-1 years	2.35	Between	12.998	2	6.499	6.156	.002
	2-3 years	2.31	Groups					
	3 & over years	1.88	Within	266.038	252	1.056		
I don't believe that jewelry affects the safety of food.	0-1 years	2.92	Between	25.094	2	12.547	7.081	.001
	2-3 years	2.11	Groups					
	3 & over years	2.39	Within	446.491	252	1.772		

Table 30: Tukey Post Hoc Test Findings of Experience and Personal Hygiene Knowledge

	Mean Difference	Standard Error	Significance
I firmly believe that I should wash my hands every time I serve food.			
0-1 years			
2-3 years	.67004	.18409	.001
3 years and over	.55541	.18531	.008
I think there is a need to be reminded after clearing dirty plates and silverware to wash hands before serving food again.			
0-1 years			
2-3 years	-.93173	.21407	.000
3 years and over	-.49648	.14927	.003
I think that the temperature of water should be at least warm for proper hand washing.			
0-1 years			
2-3 years	-.35879	.21607	.223
3 years and over	-.32247	.15067	.084
I think there should always be a hand washing facility available at off-site events.			
0-1 years			
2-3 years	-.41568	.20979	.119
3 years and over	-.16574	.14638	.495
I believe that coming to work in a dirty uniform will affect food safety			
0-1 years			
2-3 years	-.58205	.25267	.057
3 years and over	-.03118	.17619	.983
I feel if I am sick I will not affect a guest's chance of becoming ill while I am at work.			
0-1 years			
2-3 years	-.19343	.22699	.671
3 years and over	-.13068	.15828	.688

I feel that eating or drinking in the back of the house does not affect the safety of food in my area.			
0-1 years			
2-3 years	.20379	.25577	.705
3 years and over	.07989	.17835	.895
I feel single use gloves should be worn at all times when preparing food.			
0-1 years			
2-3 years	.16334	.22866	.755
3 years and over	-.09941	.15944	.807
I feel it is acceptable if I dry my hands on my uniform after washing them.			
0-1 years			
2-3 years	.03970	.19876	.978
3 years and over	.46613	.13860	.003
I don't believe that jewelry affects the safety of food.			
0-1 years			
2-3 years	.81492	.25749	.005
3 years and over	.53668	.17955	.009

Table 31: ANOVA Analysis of Experience and Personal Hygiene Frequencies

Frequency of:		Mean		Sum of Squares	d.f	Mean Square	F	p-value
Hand washing from returning from a break	0-3 years	4.28	Between	1.826	2	.913	1.137	.322
	2-3 years	4.54	Groups					
	3 & over years	4.36	Within	202.409	252	.803		
Hand washing after touching face or hair	0-1 years	2.96	Between	13.798	2	6.899	5.424	.005
	2-3 years	3.63	Groups					
	3 & over years	3.28	Within	320.539	252	1.272		

Table 32: Tukey Post Hoc Test Findings of Experience and Personal Hygiene Frequencies

	Mean Difference	Standard Error	Significance
Hand washing from returning from a break			
0-1 years			
2-3 years	-.25967	.17337	.294
3 years and over	-.08130	.12089	.780
Hand washing after touching face or hair			
0-1 years			
2-3 years	-.67282	.21017	.006
3 years and over	-.32462	.15213	.085

Summary

This chapter presented the statistical findings found in this research. Independent sample *t*-tests were conducted to measure differences between these sections and find differences between gender, training, management, and employment status. The next chapter will provide a discussion of the findings and present implications for the industry and recommendations for future research.

Chapter 5 Discussion, Conclusions and Implications

This chapter includes three sections: a discussion of the results of the study, conclusions with a review of the significance of the study, and the implications of the study. The limitations of the study and directions for future research in such areas of proper food handling, equipment use, and personal hygiene issues will be offered.

Discussion of the Results

This study poses agreement to Griffith's *et al.* (2010) study concerning food safety culture. An individual's age and amount of experience relates to their knowledge in performing certain safety practices. The present study also agrees with the findings of Yiannas (2009) in that management must be more vocal and strive to create a positive culture. This study found that management tends to have more training in food safety than non-management personnel. The lack of training for non-management personnel can pose a tremendous detriment to a catering group since these individuals come into direct contact with the food presented to the consumer. In order to ensure that food safety practices are in place and that they are being adhered to, management must take a leadership role in providing training regiments to all members of its staff. The benefits of training are consistent in this study. Many of the positive responses in the survey were directly related to the amount of training and/or experience that the respondent possessed. Therefore, training must be given to all individuals, including part-time and seasonal help.

Management can implement innovative practices to train their employees. In order to

keep costs down the “buddy system” of pairing experienced staff members with less experienced individuals or even better pairing certified employees with non-certified employees can be utilized. If management focuses on the goal of training its employees and continues to monitor their dedication to following the food safety practices they will succeed in developing a positive food safety culture. Reinforcement of proper practices and modeling these practices will also help to develop a positive culture. In addition, management can find ways to reward successful behaviors. A positive work environment can breed more positives and ultimately develop into not only a positive culture but a safe food culture.

This study shows that there is a remarkable gap in knowledge about safe practices in food handling and equipment use especially for the non-trained food servers. As identified in previous studies of Nummer *et al.* (2009), Clayton and Griffith (2002), and Hertzman & Barrash (2007), there is a definite lack of training for employees in the catering segment of the food service industry. This study parallels the findings as Nummer *et al.* (2009) in that the catering management employees did have training while the servers and other front-line employees did not have training. In this study it was found that 27.1% of the respondents had some previous food safety training, which included all of the 18% management positions that participated in the study. An overwhelming 72.9% of the respondents surveyed did not have any type of previous food safety training. It is quite astonishing to note that these individuals are working in a high risk environment without proper training. The catering industry should be put on alert and take notice of this sobering discovery.

This study also gathered similar findings with respect to hand washing practices as did Clayton and Griffith’s (2008) study. This study confirms that it is extremely important to target all members of the work force to improve proper hand washing practices and to be consistent in

completing this task. The study also confirms that food handlers and servers without previous training will not necessarily change their behavior and attitude and thereby may not practice consistent hand washing hygiene. The study points out that most servers and food handlers do not have previous training and without any type of training no one can assume that their behavior and/or attitude will improve. Clayton and Griffith (2008) determined that personal hygiene can be influenced by social pressures. This study found that individuals with more catering experience, those that are older, those that are full-time employees, and those that are in a management role are more prone to perform proper hygiene procedures more often than their counterparts. This shows why management must focus on the training of younger and less experienced employees.

This study also agrees with the findings of Hertzman and Barrash (2007) and Farrish *et al.* (2009) that there is an overwhelming need for better training and educational programs for the catering employee. Significant disparities were noted in general knowledge between those who were trained compared to those who were not trained. For example, this study and the Hertzman and Barrash's (2007) studies confirmed that there is a lack of temperature monitoring in food items, especially high-risk items. This study also discovered that temperature was not adequately monitored in the back-up of food items. Both studies determined that employees did not correctly practice wearing gloves when working around ready to eat food. Hertzman and Barrash (2007) found 131 violations in this component of food safety while the present study found that those without training on average answered that they neither disagree nor agree with wearing gloves when working with food. The average respond rate was 3.4 (on 5-point scale) for this question.

Overall it was found that employees with more experience tend to show more knowledge

concerning proper food safety procedures. As mentioned above managers can learn from this and tap into a resource of training that they might not have thought of. Practicing with a partner such as a buddy training system not only teaches new employees the proper way to do things but also encourages and models the correct food safety guidelines that must be practiced. Another strategy that can improve the food safety procedures in a catering business is to place experienced servers into a national food safety program such as ServSafe (The National Restaurant Association Educational Foundation, 2010). The veteran server will become more proficient and knowledgeable in this area and can then pass on their skills and knowledge to the less experienced individuals. This can save costs since only a part of the team is taking the actual course while the benefits of the program can help all involved. It really does not matter what the employment status of a food worker is since one or time or another they will come into contact with the food. Training for only the full-time help cannot be justified. The catering industry is a popular and growing business. Effort should be made to make sure it is a safe and positive experience for all.

The study also detected a significant gap between the perceptions of management and front line workers. As most managers are required to be food safety certified it is disturbing to find that they feel their establishments and workers have the appropriate knowledge when they do not. It was also found that over time and with years of experience workers adapt and learn proper procedures themselves. The age and experience level is a defining factor that will lend to performing proper safety measures. This study found that age and experience is significant while the Farrish *et al.*, (2009) study did not. This shows that managers can utilize their talented workers to help train and teach proper food safety procedures to part-time and beginning employees.

Implications

The implications of this research point toward management. Managers need to be aware of the importance of training. Understandably, managers may be concerned with many other details besides food safety, but food safety must be a top priority. This study found that 72.9% of the respondents answered that they have not received any training in food safety. Therefore an effort must take place to formulate training for a greater population of the catering employees. The results of this study also revealed that there is a lack of knowledge by the younger workers in essence due to the lack of training and experience on the job. Training is a critical key that will help a catering business reduce the instances of food borne illness and or the passage of these illnesses. The more aware and the better-informed employees are about food safety then the better the likelihood these harmful situations can be reduced.

Many companies pay for managers to become certified. Ironically these individuals may not deal with the food directly. All food handlers should be certified since they pose a greater risk to pass on a contaminated food or fail to compile with proper food safety measures. ServSafe (NRAEF, 2010) certification is an expensive program and may not be included in the budget for many companies, however the rewards from this program will be very beneficial. If possible a catering business should consider this certification program. If ServSafe (NRAEF, 2010) is not a feasible avenue then there are other ways to cut costs and still train and impart important knowledge to the employees. New employees can be paired with veteran employees who have experience and perform proper procedures on a daily basis. Employees working together in a buddy system until they are properly trained will help teach basic knowledge of food safety while saving costs on expensive certification programs. Inexperienced employees can benefit from the teaming method. The major focus areas that the lead employee can help

model for their partner would be personal hygiene with special emphasis on hand washing, correct equipment usage and maintenance, knowledge of food handling, exhibiting knowledge and practice of correct food temperatures when storing or serving food, and how to avoid mixing raw and cooked foods together.

This study detected that the amount of experience a server has attained will impact the amount of knowledge that the individual will take in and practice with regards to food safety. This was a significant finding that did not agree with previous studies (Farrish *et al.*, 2009). Unfortunately, there is a large turnover rate for employees in the catering field. Management of a catering business should try to keep their employees and develop stability in their staff thereby developing a more experienced food handler.

Management is ultimately responsible for the safety of their patrons and must do all that is necessary to ensure their safety. Another major implication of this study points to the training aspect of the catering personal. All employees need to be trained in some way to safeguard the health of the consumer. Management should routinely examine certification and training procedures to ensure that they are keeping their guests safe.

Educational institutions can also help to remedy the food safety issue. Hospitality schools should include food safety education in the curriculum or may need to devote more time and emphasis on food safety. Institutions can also upgrade their requirements by including a nationally recognized food safety certification as part of the graduation requirements of their program.

The results of this study can provide significant information that can be examined at the national level. The Food and Drug Administration does not provide federal guidelines in

regulating catering businesses (US FDA, 2010). The FDA does provide regulation for many other food service establishments including restaurants, schools, health-care facilities, correctional facilities, and grocery stores. Regulations for catering businesses are developed by city, county, or state levels thereby leaving the US without uniform regulations for all catering establishments and operations. The results of this study show a need for uniform regulations for all catering establishments at the federal level in order to ensure that all catering businesses meet the same food safety guidelines.

Furthermore the results of this study provide significant evidence that greater emphasis must take place to require proper training of all employees in the catering sector. An educational training program that focuses on the catering sector can be developed by utilizing the usable factors gained from literature studies, focus groups, and county health checklists. A national recognized program such as ServSafe (NACF, 2010) could examine the findings of this study and incorporate the major factors of food safety issues into a specific certification for catering employees.

Study Limitations

The limitations of this study are due to the fact that there were two different methods of distribution. Even though no remarkable differences were observed in the responses, this should be noted. There may be a bias since there was a low response rate from the online responses and since there was an administration of some of the surveys given out at several catering establishments. Although every effort was taken to lower any potential bias by management, this procedure may have produced bias. The managers at these establishments were present and the surveys were completed at the place of employment. Another limitation that can be pointed out

is that identifiable information was not taken from the respondents, therefore it is not known how even the distribution was across the country. Social desirability may also have an effect on this study. Respondents may have answered more favorably than they actually perform and this should be taken into consideration.

Future Research

This research can serve as a starting point to examine food safety in the catering sector but more studies in this area are needed and more possibilities should be explored.

Research should be extended to examine the actual behaviors of servers while in action, compared to what behaviors are being reported. Employees could be tested to determine if they are actually performing behaviors that they claim they are doing. Testing these behaviors will be difficult and poses limitations in direct observation of the individuals. Also it might be difficult to find willing employers who would allow direct observations of their operations on the job site.

Another study that can be implemented is to specifically observe off-site events to see what precautions are used to ensure food safety. Observing servers in both situations may find differences in attitude and practices involving food safety by comparing on-site operations vs. off-site operations. An observation study should be followed by this research to find if employees actually perform the tasks properly. It would be beneficial to see exactly what types of shortcuts are taking place during the most hectic times of an event. It would be important to determine what tasks are not being performed properly due to the high stress environment. Studies could also investigate any relationship between higher guest count and the occurrence of food borne outbreaks. Another avenue that can be examined is how the size of a catering or banquet operation affects their ability to implement proper food safety procedures. Studies could

be undertaken to compare the food safety procedures and implementation of these procedures in smaller scale operations to that of operations over a million square feet of conference space. Such studies would help in understanding if larger operations would need to modify their training procedures.

Additional studies should take place that examines the amount of experience employees possess with respect to their knowledge and practice of food safety. This study found that a greater amount of experience tended to yield the proper perception of food safety. However, more research is needed to solidify this conclusion.

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Appendix I

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334-844-4261

INFORMATION LETTER

for a Research Study entitled

“Analyzing Food Safety Cultures: A Means to Improve Food Safety in the Catering Sector”

You are invited to participate in a research study. The purpose of this study is to analyze behavior perceptions of the food server with regards to food safety practices in the catering arena. As food borne illnesses are still a critical concern for patrons and catering management, increasing knowledge about how food handlers perceive their role would be beneficial in identifying weaknesses in the prevention of these illnesses. The study is being conducted by Sara Ghezzi, Graduate Student, under the direction of Dr. Baker Ayoun of the Auburn University Department of Hotel and Restaurant Management. You were selected as a possible participant because you are employed in the field of catering and/or special events, a member of the National Association of Catering Executives and are of legal age in the state in which you reside (19 in AL and NE).

What will be involved if you participate? If you decide to participate in this research study, you will be asked to acknowledge your acceptance of participation via e-mail sent to ghezzse@auburn.edu. You can choose to have the survey mailed or if you wish to take the survey electronically a link is attached at the bottom of this E-mail. If not a packet including surveys will be sent to your business or another address in which you supply in your acceptance

E-mail. You will need to complete the surveys and to then send the completed surveys back in the pre-paid postage envelope. Your total time commitment will be approximately ten minutes to complete the survey. If you take the survey electronically, you only need to submit online when you are finished.

Are there any risks or discomforts? The only possible risk associated with participation in this study could be the risk of breach of confidentiality. To minimize this risk we will not collect any identifiable information from you.

Will you receive compensation for participating? To thank you for your time, you will be offered a copy of all results and information on how to improve food safety in the catering sector that was gathered from this study. If you would like a copy of the results E-mail Ghezzse@auburn.edu with information on where to send the results.

If you change your mind about participating can you withdraw from this study? You can withdraw at any time during this study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations, with the Department of Hotel and Restaurant Management of Auburn University.

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by not having identifiable information present. The information collected through your participation may be used to fulfill an educational requirement specifically for a thesis.

If you have questions about this study please do not hesitate to ask. Please contact Ms. Sara Ghezzi at (305)-803-1919 or email ghezzse@auburn.edu or contact Dr. Baker Ayoun at bma0002@auburn.edu

If you have questions about your rights as a research participant please contact the

university. You may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or email hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.

"The Auburn University Institutional Board has approved this document from July 11, 2010 to July 10, 2011. Protocol #10-184 EX 1007."

Investigator's Name Date

Co-Investigator Date

https://auburnoira.qualtrics.com/SE/?SID=SV_6gswQnUbqvre5KI

Appendix II

Survey Instrument

1. Your Gender?

- *Male*
- *Female*

2. Please choose your age range.

- *Younger than 20 years*
- *20-29 years*
- *30-39 Years*
- *40-49 Years*
- *50-59 Years*
- *60 or over years*

3. Please enter your number of years of experience in Catering and/or Special Events.

4. Please list your current work title/position.

5. Do you consider your current work position a management position?

- *Yes*
- *No*

6. Have you had any previous food safety training?

- *Yes*
- *No*

7. What is your highest formal education?

- *None/ Some High School*
- *High School Graduate*
- *Some College/ Technical School*
- *College Graduate*
- *Graduate School*
- *Military*

8. Please list any food safety training programs you have attended or completed.

9. Are you responsible for training employees or implementing programs in food safety?

- *Yes*
- *No*

10. What is your employment status?

- *Part-time*
- *Full-time*

The following section includes factors regarding the holding of food. Please choose the answer choice that best represents what you think:

11. In my area, food is kept safe during transportation to off-site events.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

12. I feel that in my area cold food items are properly monitored for temperature.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

13. I feel checking food temperatures can prevent food borne illnesses.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

14. I ensure chafers are properly lit and functioning before food is placed in them.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

15. I ensure cold food items are always placed on ice to keep temperature correct.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

16. I often ensure in the back of the house backup items for buffets are labeled and covered properly.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

Please rate how often the following happens in your area.

17. How often do you think the temperature of cold food items in your area are monitored appropriately?"

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*

18. How often is food that has been out for too long removed?

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*

19. How frequently is food placed in chafers before they are lit and checked for proper functioning?

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*

20. How often is hot food in your area maintained at a temperature above 141F?

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*

21. How often is temperature monitored in the backup of food items in the back of the house?

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*

22. How often do you mix food that has been sitting out with fresh food?

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*

The following section discusses factors related to Personal Hygiene. Please choose the answer choice that best represents what you think:

23. I firmly believe that I should wash my hands every time I serve food.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

24. I think there is a need to be reminded after clearing dirty plates and silverware to wash hands before serving food again.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

25. I think that the temperature of water should be at least warm for proper hand washing.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

26. I think there should always be a hand washing facility available at off-site events

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

27. I believe that coming to work in a dirty uniform will affect food safety.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

28. I feel if I am sick I will not affect a guest's chance of becoming ill while I am at work.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*

- *Agree*
- *Strongly Agree*

29. I feel that eating or drinking in the back of the house does not affect the safety of food in my area.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

30. I feel single use gloves should be worn at all times when preparing food.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*
-

31. I feel it is acceptable if I dry my hands on my uniform after washing them.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*
-

32. I don't believe that jewelry affects the safety of food.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

Please rate how often you do the following:

33. How often do you wash your hands when returning from a break?

- *Never*
- *Rarely*

- *Sometimes*
- *Very Often*
- *Always*

34. How frequently do you wash your hands after you touch your face and hair?"

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*

The following section discusses factors related to various Equipment. Please choose the answer choice that best represents what you think:

35. I feel that chafers are cleaned after each use in my area.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

36. I feel it is important to ensure glassware is free of chips.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

37. I believe there is no need to check chafers before an event.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

38. I feel you should only work with food at an off-site event when there is coverage overhead.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

39. I feel that ice can be mixed with raw and cooked foods and be safe for consumption.

- *Strongly Disagree*
- *Disagree*
- *Neither Agree nor Disagree*
- *Agree*
- *Strongly Agree*

Please rate how frequently the following happens in your area.

40. How often are utensils cleaned after each use?

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*

41. How often are hot holding devices checked for the proper temperature during an event?

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*

42. How often is there no hand washing facility available at an off-site event?

- *Never*
- *Rarely*
- *Sometimes*
- *Very Often*
- *Always*