

TEMPORARY PUBLIC EATING PLACES: FOOD SAFETY KNOWLEDGE AND
PRACTICES

A Thesis
presented to
the Faculty of the Graduate School
at the University of Missouri

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by
PHIL NEEL
Dr. James Groves, Thesis Supervisor
JULY 2010

The undersigned, appointed by the dean of the Graduate School, have examined the thesis entitled

TEMPORARY EATING PLACES: FOOD SAFETY KNOWLEDGE AND
PRACTICES

presented by Phil Neel,

a candidate for the degree of master of science,

and hereby certify that, in their opinion, it is worthy of acceptance.

Dr. James Groves, Food Science Dept. (HRM)

Dr. Mark Ellersieck, Statistics

Dr. Dae-Young Kim, Food Science Dept. (HRM)

ACKNOWLEDGEMENTS

I would like to thank Dr. Jim Groves for his patience and guidance throughout the thesis process.

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Philip Neel

Dr. James Groves, Thesis Supervisor

ABSTRACT

Food borne illness outbreaks are still a serious health problem in the US, even though the knowledge and training materials needed to prevent the outbreaks are readily available. It is important for those whose activities have an effect on the number of illness outbreaks to have as much knowledge about cause and prevention as possible. In addition, temporary food establishments seem to have an increased risk of illness outbreak. Therefore a survey was conducted to explore the food safety knowledge levels and attitudes of those who work in such establishments. The results show strengths in personal hygiene and contamination control, but also deficiency in the areas of cooling/reheating, and contamination control. Since this study is an update of a similar one done in Delaware in 1993, the results have been compared.

Chapter 1

Introduction

1.1 Background and Setting

Maintaining food safety is an ongoing activity that involves anyone who prepares food. Even though food manufacturing and preparation is overseen at the federal and municipal levels, food borne illness is still a major health risk. In 1999 the CDC estimated that 76 million cases of food borne disease occur each year in the United States., resulting in 325,000 hospitalizations and 5,000 deaths (Dewaal, Hicks, Barlow, Alderton, & Vegosen, 2006). The US Department of Agriculture in 1997 estimated that the costs associated with the seven most debilitating food borne diseases could range from \$6.5 million to as high as \$34.9 billion per year. Other government agencies in 2002 estimated that the loss of productivity could be as high as \$40 billion, with hospitalization costs topping \$3 billion (Almanza & Nesmith, 2004).

Most illness cases are isolated, but when a number of individuals are infected by eating food from a common source it is considered an outbreak. Food borne illness outbreaks in recent years have been associated with eating foods such as tomatoes, unpasteurized milk/cheese, snow peas, basil, ground beef, and turkey. Between 1990 and 2003, foods linked regularly to outbreaks in which the source was known were seafood (n=899), produce (n=554), poultry

(n=476), beef (n=438), and eggs (n=329). Multi ingredient foods such as sandwiches and pizza, also contributed to 812 outbreaks (Dewaal et al, 2006). In addition, since 1996, the CDC has conducted population based surveillance of food borne illness outbreaks in 10 US states. In these states the epidemiological research indicates that the majority of food borne illness outbreaks occurs in food service establishments, and also found that catering meals outside the home is an additional risk factor for those consuming the products (Green & Selman, 2005). The CDC also operates "FoodNet" or the Foodborne Diseases Active Surveillance Network, and in 2005, 59% of food borne illness outbreaks reported to FoodNet were associated with restaurants (Roberts, Barret, Howells, Shanklin, Pilling, & Brannon, 2008). Research on food borne illness factors has shown that in food establishments most outbreaks are due to improper food handling practices by food workers and observational studies have further shown that many food service workers engage in unsafe preparation practices for a variety of reasons (Roberts et al. and Castel, Edwards, Totaro, Anthony, Moore, & Blythe, 2005). One study asserts that the increase in restaurant food consumption follows with an increased risk of illnesses being transmitted by food service workers (Almanza & Nesmith, 2004).

Food safety training is recognized as a way to assure public health, and yet illness outbreaks continue to be a serious health hazard. The food handler is one of the links between food service and disease outbreaks, and his or her level of training and knowledge, in addition to attitudes about food safety, are crucial

to reducing the occurrence of food borne disease. The food handler practices that are the largest contributors to food borne disease outbreak are related to time and temperature control, personal hygiene, and cross contamination/contamination control (Pilling, Brannon, Shanklin, Roberts, Barret, & Howells, 2008). These practices are highly regulated, and when an outbreak occurs, noncompliance with the regulation may have contributed.

In many cases, a food handler may not have adequate training or knowledge to perform critical tasks properly. In addition, even if a food handler possesses the proper training and knowledge, other factors may prevent proper performance. Lack of adequate accessible hand washing facilities, time pressures, and food handler attitudes toward a practice are some of the factors. An example of an attitude that may contribute to an improper practice is one in which a food handler believes he or she does not need to use a thermometer to check for proper temperature because the ability to recognize the proper temperature by the way the food looks or feels has been learned through repetition (Green & Selman, 2005).

Improper food handling practices may be more of a problem in the home, churches, fraternal organizations, service organizations, and other low volume or temporary food service establishments in which lack of training, use of home techniques, or inexperience may lead to outbreaks of food borne illness. Some surveys have been done to determine the practice of food handlers in

other than a restaurant setting but few have been done to assess the knowledge and attitudes of food handlers at temporary facilities, and even less at outdoor events such as state fairs. Further, studies that have been done at fairs where farm animals are present indicate an additional zoonotic risk pathway present when attendees had contact with animals and then consumed food prepared at the fair (Matyas & Braden, 2004).

1.2 Statement of the Problem

How much knowledge do temporary establishment food handlers have and what are their attitudes about food safety? The purpose of this study will be to explore the knowledge and attitudes of food handlers at temporary facilities. As mentioned earlier, food borne illness outbreaks are still a serious health problem in the US, even though the knowledge and training materials needed to prevent the outbreaks are readily available. The CDC and the US Department of Agriculture have conducted surveillance programs to track outbreaks and work on prevention, but in the demographic areas in which data has been kept, the incidence of major illness outbreaks have not gone down nearly as much as was hoped (Pilling et al., 2008). In temporary food facilities, is a different training approach necessary? Do the food handlers in these facilities have constraints or attitudes that hinder the proper techniques needed to prevent illness outbreaks?

1.3 Statement of Purpose

The purpose of the study is to explore food handler's knowledge of and attitudes toward food safety at temporary food facilities.

1.4 Research Objectives

The objectives of this study will be to explore:

1. The demographic characteristics of food handlers at temporary facilities
2. The level of knowledge of proper food handling practice possessed by food handlers at temporary facilities.
3. The attitudes of food handlers at temporary facilities toward proper food handling practice.
4. How the present study compares with the original study it is updating.

This study is, in part, a replication of a study performed at the Delaware State Fair in July of 1993, and uses the same questionnaire. In the text, the 1993 study is referred to as the original study, and the current study is referred to as the replicated or updated study.

1.4.1 Definitions

Cross Contamination

Cross contamination occurs when microorganisms are transferred from one food or surface to another.

Food Code

The Food Code is a compilation of standards for retail food service workers and was developed in collaboration with the Conference for Food Protection; the Centers for Disease Control and Prevention and FDA of the Department of Health and Human Services; and the Food Safety and Inspection Service of the U.S. Department of Agriculture.

Full Service Restaurant

A full service restaurant is one that has sit down service with servers and hosts.

Quick Service Restaurant

A quick service restaurant is one in which there are usually no servers. There may or may not be seating, and diners usually pick up their orders at a service counter.

ServSafe Manager Training

Nationally recognized and accredited food safety training for managers developed by the National Restaurant Association.

Temporary Food Service Establishment

A temporary food service establishment is a vendor who prepares and serves food to the public in connection with a temporary event such as a fair, festival, or other public gathering, and is in business on site for no longer than the duration of the event.

1.5 Limitations of the Study

This study is limited to temporary food service establishments. In addition, it is limited to those establishments that serve potentially hazardous foods. Since this study is similar in scope to one done in Delaware in 1993, it has a limited scope and employs a convenience sample. Therefore it may not be possible to generalize to any other population.

1.6 Significance of the Study

This study is significant in that little research has been done about the knowledge and attitudes of food service workers outside the restaurant setting and in a temporary facility. Given the fact that food borne illness continues to be a significant health problem, research about the barriers to proper food

preparation practice is warranted to help quantify sources of illness outbreaks, and also to gain additional insight that may lead to training strategies that will improve food handler performance and reduce food borne illness outbreaks.

Chapter 2

Literature Review

Little research has been done to assess the knowledge and attitudes of food handlers in temporary facilities. More has been done to assess these variables in restaurants and institutional settings as well as a few that examine catering situations, and one or more that assesses knowledge levels in the home setting. Consequently, less information is available about the incidence of food borne disease outbreaks associated with this type of food vendor.

2.1 Illness Outbreaks and Causes

There is information identifying the types of foods that are most commonly linked to disease outbreaks in reported cases. In 2006, The Center for Science in the Public Interest (CPSI) compiled a listing of reported outbreaks with identified vehicles ($n=4486$) and cases ($n=138,622$) in the United States, their associated pathogens, food vehicles linked to those pathogens, and the number of infection instances, from sources such as the Centers for Disease Control and Prevention (CDC), state health departments, and scientific journals. Of that number, the foods most commonly associated with outbreaks were seafood 20%, produce 12%, poultry 11%, beef 10%, and eggs 7%. This represents 60% of the outbreaks, and 55% of the cases. Foods

with multiple ingredients including pizza and sandwiches were associated with 18% of the outbreaks. 27% of the outbreaks were attributed to meats, 66% were attributed to other food items, and 7% were linked to multiple food items. It is important to note that these are just the reported cases and the actual number is not known. However, previous studies indicate that underreporting is a major issue. In addition, oversight of the various parameters involved in documenting, preventing, and administering education about food borne diseases is not uniform and is actually the responsibility of twelve different federal agencies. This fact may contribute to the risks. (Dewaal et al.,2006).

In 2003, the CDC reported a *Salmonella* outbreak at a Maryland temporary Church Fundraiser. Under Maryland law, the church involved was defined as an "excluded organization" and was exempt from licensing requirements because they did not regularly serve food more than four days per week, although they were allowed to serve food for up to 14 days once per year. They were, however, required to have a permit for the event and were subject to Maryland food safety requirements and inspections. In the five year period from 1998 -2003, 14 (2%) of the 660 reported outbreaks in Maryland were associated with excluded or unlicensed organizations. The outbreak was caused by under cooked crab cakes containing raw shell eggs, and thermometers were not used to determine the internal temperature of the crab cakes. The event had 400 attendees and 104 cases were identified out of the 189 attendees that were interviewed. The study concluded that awareness of the proper food handling

techniques may have been inadequate. In addition, the authors recommended that these excluded groups should have closer monitoring by health departments because;

"they often serve food to large numbers of people, and often have food handlers who may not have training in proper food handling techniques, and because other large food borne disease outbreaks have been associated with this type of group."(Castel et al.,2005).

From 1973 through 1997, several government agencies including the CDC compiled statistics on the reported outbreaks of food borne illness in schools, from the primary through the university levels. The compilation was from state and local health departments and included 604 outbreaks. This resulted in 49,963 illnesses, 1514 hospitalizations, and one death. *Salmonella* was the most common pathogen, and the foods most commonly associated with the outbreaks were poultry (18.6%), salads (6%), Mexican style foods (6%), beef (5.7%), and dairy products (5%). Most of the poultry outbreaks were attributed to turkey. It is noted that over time, the poultry and dairy outbreaks decreased, while outbreaks involving salads increased considerably. The majority of outbreaks were attributed to food prepared on school premises, and practices associated with the outbreaks include improper refrigeration, prolonged handling, and inadequate reheating. 57% of the outbreaks were likely caused by food handler contamination (Daniels, MacKinnon, Rowe, Bean,

Griffen, & Meade, 2002).

2.2 Training and Knowledge

Even though improvements have been made in restaurant handling of food and prevention of disease, that source is still a significant contributor to recent outbreaks. In 2005, 59% of the food borne illness outbreaks were traced to restaurants, and the top five risk factors were; improper holding temperatures, inadequate cooking, contaminated equipment, buying and receiving food from unsafe sources, and poor personal hygiene.

In 1998, the Food and Drug Administration (FDA) conducted a study to determine the compliance rate of food handlers with the requirements in the Food Code. Quick service restaurants had a 60% compliance rate, and full service restaurants were at 74%. The rates are lower than those achieved by schools, nursing homes, and hospitals. The lack of compliance was related mostly to improper holding time/temperatures, and poor personal hygiene (Roberts et al., 2008).

Research has found that food safety training on proper food handling practices, and obtaining food safety knowledge does not always result in improved behaviors. It has also been found that food service manager certification produced no significant improvement in knowledge scores or inspection scores whether the tests were administered immediately following

certification or six months later (Roberts et al.,2008).

A study has compared inspection violations for food service facilities with varying numbers of food handlers whether trained or not. It was found that the number of food handlers trained in food safety had no significant effect on food safety inspection violations. Moreover, a study published in 2008 found that overall behavioral compliance did not increase even after training.

Training does have an influence on hand washing knowledge and behavior, but much less influence on cross contamination control and thermometer use (Roberts et al., 2008).

A Florida study determined that after training, the incidence of "many factors" that contribute to food borne illness outbreaks actually increased (Hammond, Brooks, Schlottmann, Johnson, & Johnson, 2005).

Deficiencies related to time/temperature control, improper hygiene, and cross contamination contribute heavily to food borne illness, and are all related to a food handler's non compliance with the essential food safety guidelines.

Currently available food safety training that is designed to increase knowledge of proper food safety practices for managers has been shown effective by previous research. One study compared manager's knowledge based on the type of training; health department, corporate, and no training, and found that training did increase knowledge such that the overall knowledge

level was fairly high at 87.2% (Lynch, Elledge, Griffith, & Boatright, 2003). However, in another study, handlers from restaurants with mandatory food handler training had lower knowledge in two of three food safety behaviors which have the largest contribution to incidences of food borne illnesses. Those behaviors are; hand washing, use of thermometers, and proper handling of food and work surfaces. Their knowledge level was at 78%.

The study found that having a knowledgeable manager was of more importance than mandatory training for all food handlers. Moreover, mandatory training is not associated with either improved knowledge or improved behavior. It was speculated that managers felt an increased obligation to train their co-workers about food safety. And also, since their study had no supporting evidence, it was found that training for food handlers was too short, inadequate, and poor, while ServSafe manager training was much more effective. However, a few aspects of mandatory training may be effective for some behaviors. For example, the ServSafe training guide recommends including a demonstration of hand washing effectiveness in which employees apply an invisible powder to their hands that glows under black light. After washing they can see what they missed under the glow of the ultraviolet light. This graphic demonstration may help them internalize the need for thorough hand washing, especially under their fingernails.

This particular study noted that compliance with a number of specific

food safety behaviors was very low, and argued that barriers to proper behavior must be identified and remedied in order to improve performance. Some of the food handler identified barriers include inadequate resources and supplies, lack of training, lack of time, and negative consequences of performing the behaviors. There must be a perceived reduction in the barriers before improvement will take place. Much of this reduction is in the hands of the managers, such as making sure that adequate resources are available, reducing time pressures that keep handlers from performing the proper behavior, and eliminating negative consequences associated with the behavior. (Pilling et al., 2008).

Another study used focus groups to explore food handler's perceptions of seven different food safety practices, and the factors impacting their performance. They included hand washing, cross contamination prevention, glove use, and food doneness, holding, cooling, and reheating (Green and Selman 2005).

The most frequently identified factor having an impact on the ability to wash hands was sink accessibility. Too few sinks or sinks inconvenient to the work area were barriers and these factors were exacerbated by time pressure during very busy periods, or when staffing was low. If food handlers had a large number of orders to fill, hand washing was a lower priority. However, if managers and coworkers placed an emphasis and attention on proper hand

washing, then it was done more frequently. If the handlers expected a reprimand from a manager or a question from a coworker, they were more likely to keep their hands properly washed. They also said that frequent hand washing sometimes irritated their hands and that fact led to reduced performance. Some indicated that they used hand sanitizer in place of hand washing, and some said that they used gloves to assure hand cleanliness. It was also mentioned that some handlers felt that they did not need to wash their hands if they used gloves (Green & Selman, 2005).

The practices workers associated with cross-contamination control were cleaning and sanitizing work surfaces, utensils, and equipment after working with raw meat. They mentioned using gloves and utensils to prevent bare hand contact with raw meat, and keeping raw meats separated from other foods. Other cross contamination control practices include using color coded cutting boards for different foods, washing hands after handling raw meats, using stainless steel bowls and work surfaces, and refraining from doing other kitchen tasks until they were finished with the ones involving raw meats. A few handlers said they flipped their cutting boards over after soiling them rather than getting clean ones. When they were asked about the factors impacting their ability to properly perform cross-contamination control, they listed using color coded boards and disposable gloves as positive factors, except to say that wearing gloves might keep them from washing their hands enough. They also mentioned that using bleach water helped allow them to safely control cross-

contamination. In addition, separation of work areas involving raw meats from those where other foods were prepared, "looking out" for each other, management involvement, food safety training, using pre-cooked or prepared meats, and negative consequences for non-compliance and education were also listed as facilitators for proper performance of cross-contamination control. Time pressure and language differences were noted as negative factors (Green & Selman, 2005).

The focus groups were positive about glove use in a variety of situations, but unsafe practices were identified. A few workers said they changed gloves instead of washing their hands, and a few also said they washed their hands with their gloves on.

The groups mentioned management and coworker emphasis on glove use and negative consequences for failing to use them as positive factors, as well as managers wearing gloves to set an example. Negative factors were ill fitting or uncomfortable gloves, some tasks that were difficult to perform with gloves on, and time pressure.

Only a few of the workers felt that the use of thermometers was always necessary to test for food doneness. Most felt that they could determine doneness by appearance or feel, and they were more likely to use thermometers in certain foods such as seafood or larger pieces of meat (Green & Selman, 2005).

The negative factors mentioned as having an impact on thermometer use were time pressure, and that some foods were difficult to test. The need to sanitize the thermometer after each use also prevented more frequent use. Keeping logs as a process was a facilitator, as the logs were kept for use by health inspectors.

Practices mentioned for holding foods were the use of steam tables for hot foods, walk in coolers, refrigerated sandwich preparation tables and salad bars where the foods were set in ice. Some said they checked the temperatures either every half hour or once per shift, and that managers were more likely to be the ones performing the tests. Some said temperature logs were kept, foods were stirred periodically to keep temperature uniform, and they mentioned efforts to keep held foods covered as much as possible. Proper equipment was the most mentioned factor impacting food holding, along with management involvement. Time pressure was mentioned as a negative factor due to lids being open too much, and inability to watch the quality of the held food (Green & Selman, 2005).

Cooling practices mentioned included placing foods in a walk in cooler, transferring foods to smaller or shallower pans, using ice baths or ice stirring paddles, and one worker mentioned the use of a blast chiller. This topic also uncovered the use of unsafe practices such as cooling food on counters at room temperature, and only checking the temperature of cooled foods the morning

after placing them in the walk in.

The need to cool foods near closing, which prevents proper cooling practice and time pressure were seen as negative factors. Proper equipment and adequate space for cooling, in addition to worker motivation and management emphasis were seen as positive factors (Green & Selman, 2005).

Several of the workers asked said that they reheated foods prior to placing them in hot holding, and some said they discarded foods rather than reheating them. Most said they check the temperature of reheated foods and some recorded those temperatures in logs.

Few factors were identified concerning reheating practice. A few workers said that training and the availability of thermometers were positive factors and time pressure was again mentioned as a possible barrier (Green & Selman, 2005).

Another focus group study performed in Oregon in 2007 focused exclusively on food worker's ideas about hand washing behaviors and barriers in the restaurant setting. They found the same barriers as previous studies have; namely, time pressure, inadequate facilities and supplies, lack of accountability, not enough manager involvement, and management structure not supportive of proper hand washing practices. These focus group participants also mentioned that ineffective training also contributed to poor performance. They believe that food education testing consisted of nothing more than memorization, and

suggested that "hands on" training would be more effective (Pragle, Harding, & Mack, 2007).

When the workers were questioned about their knowledge, some said that they had seen fellow workers using hand sanitizers as an alternative to hand washing, and that some, primarily those who worked at the "grill" or the "cook line", used "bleach water" as an alternative. This practice was not widespread due to the damage bleach did to the hands (Pragle et al., 2007).

Focus group participants indicated that they used gloves when handling raw meat, when they had cuts on their hands, and also when they were working with "sticky" food products. Most said that the use of gloves prevented consistent hand washing. A few said they felt that glove use was a nuisance because of the need for frequent changing, their use slowed down food preparation, and that glove use was dangerous near open flames.

Another hand washing barrier mentioned by participants in this study was that hand washing facilities were neglected, with broken towel or soap dispensers, and a lack of hot water and sanitizer solutions. Once again, time pressure was mentioned as a barrier. Participants said that since they usually had to complete multiple tasks, there was not enough time to visit the hand wash sink after each one. They also felt that lack of training gave them the perception that their employers did not consider hand washing to be a vital practice (Pragle et al., 2007).

The main theme that emerged when participants were asked for positive factors that would promote proper hand washing was manager and health inspector "proactive" involvement. Positive reinforcement such as general cleanliness in the kitchen and posted reminders above the sinks and in the restrooms was helpful. They felt that more inspections and an inspector that was willing to comment and help educate would increase compliance. Also, workers felt that having an awareness and concern for their customers health was essential: "It comes down to the consciousness of the guy who knew that he just took out a chicken breast and put it on the grill and then went over and made a salad. He knew that, and didn't care."

One conclusion of the study is that food handlers know that they should be washing their hands but barriers in their work environment prevent them from properly implementing their knowledge. Workers expect a high degree of involvement and support from their managers and also from health inspectors. In order for them to know it is important to care, they must first know that those above them share that sentiment. Food safety training therefore needs to incorporate strategies to eliminate the barriers to proper handling practice in order to improve compliance and reduce the incidence of food borne disease outbreak (Pragle et al., 2007).

Chapter 3

Methodology

3.1 Introduction

Food safety is not complicated. However, prevention of food borne illness does require a certain amount of knowledge. In the past, training and education in the methods required to keep food safe has been incomplete or non-existent. Currently, complete training that can equip any food producer with all the necessary tools to keep his or her product safe for public consumption is readily available for food service employees in traditional restaurant and food service settings in most locales. Yet, food borne illness continues to occur.

In Missouri, food service workers classified as "managers" are required to take a class in food safety and pass a proficiency examination. However, subordinates need only pass a cursory exam with minimal actual training. For temporary establishments, the requirements are no different, but information about workers in this setting is limited. In addition, home food handlers are generally less knowledgeable than their industry counterparts because there are no training requirements for home food production. Many temporary food service workers are home cooks who volunteer or work part time at fairs, church functions, and fraternal or service clubs. Assessing this set of workers as to their knowledge levels of food safety practices, and also their attitudes about those practices, are the characteristics of interest in this study. Any insight

gained could be helpful for the further development of effective training strategies, with the ultimate goal of reducing outbreaks of food borne illness.

The purpose of this chapter is to describe the methods by which the survey was accomplished, including the type of statistics employed, how the questionnaire was constructed, who was included in the survey, and how the data was collected.

3.2 Research Design

The type of research being conducted is descriptive survey, and its purpose is to make generalizations about a target population. The end sought is to discuss contemporary conditions or the present status of the population in question. Descriptive research is basically the study of: "What exists?" (Miller, Torres, Lindner, 2005)

In this case a mailed questionnaire is the method used for data collection, and the overall research is termed a "survey" because its general purpose is to "explore and describe" existing conditions. In order to generalize to an entire population, random sampling or a census frame is necessary. For this study, the frame is one of convenience, given the small population of those included in the objectives, and the difficulty of attempting to identify and randomly sample such a small number. Therefore, generalization will only be made to the sampled population. (Miller, et al., 2005)

3.3 Population and Sample

The population consists of people who have worked in temporary food service establishments. The primary frame was a list of all vendors participating in the 2009 Missouri State Fair, which was obtained from the Missouri State Fair administration. 9 different vendors contributed 17 respondents. Another ten respondents were obtained from hand deliveries to vendors at Columbia's "Roots and Blues" festival, and a further 15 were local individuals who had previously worked at temporary food establishments. This yielded a total of forty two (n=42). Since this is a convenience sample, sampling and frame errors were not controlled. Non response was not addressed; therefore generalization will only be made to the respondents.

3.4 Instrumentation

This study is, in part, a replication of a study performed at the Delaware State Fair in July of 1993, and uses the same questionnaire. No changes were made other than two of the demographic questions specific to Delaware were updated to reflect the present locality. The original study included an on site observation checklist. The author noted the difficulty encountered using the checklist to obtain objective data. The present study did not attempt replication of the observation checklist.

The questionnaire used contains 14 Lickert scale type questions designed to assess food safety attitudes and practices. To assess food safety

knowledge, it includes 5 true/false questions and 5 multiple choice questions. 8 questions assess demographics, for a total of 32.

3.5 Validity and Reliability

Validity and reliability were established in the Delaware study by a pilot test with the employees of the University of Delaware dining services, and field tested at the 1993 Delaware State Fair.

3.6 Data Collection

Two weeks prior to sending survey packets, postcards were sent to inform the vendors at the Missouri State Fair that they were to receive the questionnaire. Packets containing a cover letter, four questionnaires, and a stamped return envelope were mailed to sixty-eight vendors. Nine vendors returned a total of seventeen questionnaires. There were no follow up mailings. 10 questionnaires were hand delivered and filled out at a local fair, and an additional 15 were obtained by canvassing at a local business.

Chapter 4

Results

4.1 Findings

Research objective one sought to describe the demographic characteristics of food handlers at temporary facilities, and the results are shown in Table 1. Of the 42 food handlers who completed the questionnaire, 50% were male and 50% were female, with a mean age range of 36 to 55 years. 50% (21) respondents reported this range, and 4.8% (2) were under 21. 10 were 21 to 35, and 2 respondents were in the 55 to 65 range. 16.7% (7) were 66 or older.

Of the food handlers surveyed, 71.4% (30) reported education beyond high school. Just over 21% (9) reported some college, and 26.2% (11) had attained a college degree. In addition, 7.1 % (3) attended graduate school, and 9.5 % (4) held a graduate degree. Just 2.4% (1) had less than a high school diploma and 4.8% (2) attended technical or trade school.

There was 38.1 % (16) of the food handlers who had never worked in a food establishment that was not temporary, and of the 61.9% (26) who had, just over half reported 5 or more years of experience.

Table 1
Demographic Characteristics of Respondents (n=42)

Characteristic	Frequency	%	Median	Mode
Sex			.50	0.00
Male	21	50		
Female	21	50		
Age			3.0	3.0
Under 21	2	4.8		
21 to 35	10	23.8		
36 to 55	21	50		
56 to 65	2	4.8		
66 and older	7	16.7		
Education			5.5	7.0
Some HS	1	2.4		
HS Diploma	9	21.4		
Some college	9	21.4		
Tech School	2	4.8		
2 Yr. Degree	3	7.1		
4 Yr. Degree	11	26.2		
Some Grad.	3	7.1		
Graduate Deg.	4	9.5		
Other than Temp			1.0	1.0
Yes	26	62		
No	16	38		
Temp. Estab.			2.0	1.0
1	3	7.1		
2	1	2.4		
3	7	16.7		
4	1	2.4		
5 or more	13	31		

Research objective two sought to describe the level of knowledge of proper food handling practice that food handlers at temporary facilities possess. Results are shown in Tables 2, 3, and 4. The questions used three types of responses, which include a five point Likert scale, true/false, and multiple choice. Responses for the Likert scale questions were divided into five categories, which are; cross contamination, cooling/reheating, temperature control, personal hygiene, and miscellaneous. They are reported in terms of percent agreement, percent disagreement, percent neutral, and also averaged for each category (Table 2). The Likert scale responses were also reported in terms of the mean and standard deviation of the responses, with average mean reported for the category (Table 3). All of the questions listed in each table were abbreviated and each question's placement number in the questionnaire is given. The questionnaire is located in Appendix 1.

Table 2 results are as follows: In the cross contamination category, mean agreement was 98.5% with 1.6% disagreement. Within that category all respondents agreed that smoking should not allowed in food prep and service areas.

The cooling/reheating category had 75.8% mean agreement, 17.8% disagreement, and 6.4% neutral. The response to the question regarding the proper size container for cooling had the lowest agreement, with 63.5% agreement, 26.8% disagreement, and 9.8% neutral. The temperature control category received 80.9 % agreement, 15.9% disagreement, and 2.4% neutral.

The responses in the personal hygiene category showed 82.2% agreement,

11.9% disagreement, and 6% neutral. Within the category, 100% of the respondents agreed that hand washing was important in keeping food safe to eat.

In the miscellaneous category, mean agreement was 69%, with 12.7% disagreement, and 18.3% neutral.

Table 2
Response to Statements about Food Safety in 5 Categories (n=42)

Statement ¹	% St. Agree/Agree ²	%St. Disagree/Disagree	%Neutral
Cross Contamination	98.5³	1.6	
Smoking (1) ⁴	100.0		
Sanitizer (9)	97.7	2.4	
Hand washing (10)	97.7	2.4	
Cooling/Reheating	75.8	17.8	6.4
Cooling Food (5) ⁴	83.0	17.1	9.5
Reheat to 165° (7)	80.9	9.5	
Container Size (11)	63.5	26.8	9.8
Temp. Control	80.9	15.9	2.4
Thawing Food (3) ⁴	71.4	28.6	
Thermometer Use (6)	90.5	7.1	
Ambient Temp. (12)	80.9	11.9	7.2
Personal Hygiene	82.2	11.9	6.0
Hand Washing (2)	100.0		
Clean Apron/Hat (14)	64.3	23.8	11.9
Miscellaneous	69.0	12.7	18.3
Using Smell (4) ⁴	64.3	11.9	23.8
When In Doubt (8)	92.8	2.4	4.8
Same Proc. At Home (13)	50.0	23.8	26.2

1. Numbers in parentheses are the statement numbers in the questionnaire, located in Appendix 1.
2. Valid % throughout table. Missing responses omitted.
3. Numbers in bold are means for the category.
4. Recoded to include the word “not”.

Table 3 is similar to Table 2 except that the results are listed in terms of the mean and standard deviation within the five point scale. The cross contamination category had close agreement, and showed an average mean of 4.94, with a standard deviation of 0.05, but the cooling/reheating category was lower and had an average mean of 3.58, with a standard deviation of 0.81. The temperature control category had an average mean of 4.32, with a standard deviation of 0.17. The personal hygiene category had similar agreement, with an average mean of 4.38, and a standard deviation of 0.81, and the miscellaneous category, the final one in the table, showed an average mean of 3.87, with a standard deviation of 0.61.

Table 3
Mean Agreement to Statements about Food Safety in 5 Categories¹ (n=42)

Statement ²	Mean	Standard Dev.
Cross Contamination	4.94³	0.05
Smoking (1) ⁴	5.00	0.00
Sanitizer (9)	4.93	0.34
Hand washing (10)	4.90	0.48
Cooling/Reheating	3.58	0.81
Cooling Food (5) ⁴	2.68	1.62
Reheat to 165° (7)	4.26	1.19
Container Size (11)	3.81	1.23
Temp. Control	4.32	0.17
Thawing Food (3) ⁴	4.19	0.94
Thermometer Use (6)	4.52	0.74
Ambient Temp. (12)	4.26	1.08
Personal Hygiene	4.38	0.81
Hand Washing (2)	4.95	0.22
Clean Apron/Hat (14)	3.81	1.49
Miscellaneous	3.87	0.61
Using Smell (4) ⁴	3.61	1.46
When In Doubt (8)	4.57	0.94
Same Proc. At Home (13)	3.43	1.33

1. 5 point Likert scale.
2. Numbers in parentheses are the statement numbers in the questionnaire, located in Appendix 1.
3. Mean and standard deviation for category.

4. Recoded to include the word “not”.

The true/false and multiple choice responses were combined and divided into four categories, which are; cross contamination, cooling/reheating, temperature control, and personal hygiene. These responses were reported in terms of percent agreement, percent disagreement, percent neutral, and also averaged for each category (Table 4).

In the cross contamination category respondents scored well, and got an average 98.4% average correct and 1.6% incorrect, but the cooling/reheating category had the lowest average correct answers with 23% correct and 74.6% incorrect. The temperature control category had the next lowest average correct answers with 60% correct and 40% incorrect. Scoring in the personal hygiene category was also high, and respondents got 97.6% correct and 2.4% incorrect.

Table 4
Response to Multiple Choice and T/F Questions in 4 Categories (n=42)

Question ¹	% Correct ²	% Incorrect	% Not sure
Cross contamination	98.4³	1.6⁴	
Keeping Foods separate (16)	97.6	2.4	
Equipment Sanitation (19)	97.6		2.4
Handling Cooked Food (24)	100.0		
Cooling/Reheating	23.0	74.6	
Holding Temperature (18)	11.9	83.3	4.8
Pan Height for Cooling (20)	34.1	58.6	7.3
Temperature Control	60.0	40.0	
Temp. Danger Zone (15)	78.6	4.8	16.7
Salad Ingredient Temp. (17)	63.4	12.2	24.4
Frozen Food Temp (21)	38.1	61.9	
Personal Hygiene	97.6	2.4	
Sick Employees (22)	97.6	2.4	
Hand Washing (23)	97.6	2.4	

1. Numbers in parentheses are the statement numbers in the questionnaire, located in Appendix 1.
2. Valid % throughout table. Missing responses omitted.
3. Numbers in bold are means for the category.

4. Incorrect and not sure responses combined for overall.

Research objective 4 sought to describe how the present study compares to the original study it is updating. Results are shown in Tables 5 and 6. Table 5 compared the average agreement of Likert scale responses from the original study to the present one in the same five categories, and in the cross contamination category average agreement was 91.2% in the original study and 98.5% in the present study. However, there was more disparity in the cooling/reheating category where average agreement was 49.7% in the original study and 75.8% in the present one. The temperature control category had the highest comparative difference, and average agreement was 56.6% in the original study and 80.9% in the present study. In the personal hygiene category average agreement was 71.9% in the original study and 82.2% in the present one. And finally, in the miscellaneous category average agreement was 75.5% in the original study compared to 69.0% in the present one.

Table 5
Multiple response statement¹ agreement: original study (n=64), and replication (n=42)

Category	Original%	Replication%
Cross Contamination	91.2	98.5
Cooling/Reheating	49.7	75.8
Temperature Control	56.6	80.9
Personal Hygiene	71.9	82.2
Miscellaneous	75.5	69.0

1. 5 point Likert scale.

Table 6 compared the average agreement of true/false and multiple choice responses from the original study to the present one in the same four categories. In the cross contamination category the average of correct responses was 87.8% in the original study and 98.4% in the present one. The cooling/reheating category was low in both studies with the average of correct responses at 37.7% in the original study and 23.0% in the present study. The average of correct responses in the temperature control category was 62.6% in the original study and 60.0% in the present study. Finally, in the personal hygiene category the average of correct responses was 83.6% in the original study and 97.6% in the present one.

Table 6
Multiple choice-true/false performance: original study (n=64), and replication (n=42)

Category	Original%	Replication%
Cross Contamination	87.8	98.4
Cooling/Reheating	37.7	23.0
Temperature Control	62.6	60.0
Personal Hygiene	83.6	97.6

Chapter 5

Summary, Conclusions, and Recommendations

5.1 Summary

This study has attempted to gather information about the knowledge, attitudes, and practices in temporary eating establishments. It utilized a survey and descriptive statistics. In addition it is a replication of a previous study in which the goal was to improve training methods and utilization. Even though the population studied is small, some trends, strengths, and deficiencies are noted.

5.2 Conclusions

The results of this study tend to agree with the literature. In addition, data trends evident in the original study, with a couple of exceptions, mirror those of the present study. There were some strengths found in the current study that indicate improvement in some areas of food safety practices, although given the limitations, it is impossible to say with any certainty if they are general improvements, or if so, why they happened. A few possibilities will be given.

As regards attitudes about food safety, the highest agreement was in the categories of cross contamination and personal hygiene. All the respondents

knew that smoking should not be allowed in a kitchen. This could be a result of training or possibly because smoking has been a popular health related subject in recent years; in addition to evolving public opinion about smoking in general.

Respondents also agreed that thorough hand washing is important for general food safety, and also to prevent cross contamination after handling raw meats. Again, this could be the result of improved training, and/or an increased awareness due to recent high profile outbreaks of food borne illness associated with beef. However, a fairly large number didn't share the idea that clean aprons and hats enhance contamination control. In the process of distributing questionnaires a few respondents were observed, but none were seen wearing hats or aprons.

The largest attitude deficiencies in this study were noted in the categories of cooling/ reheating and temperature control. Many respondents did not know proper food reheating procedure, concepts pertaining to proper holding and cooling of cooked food, nor the proper procedure for thawing frozen foods. If not a problem with training, these deficiencies could be related to the nature of the temporary facility. They may not have as many opportunities to handle and thaw frozen food or have a need for more than temporary finished product holding.

The practical knowledge assessment also showed strength in contamination control and personal hygiene, and the correct response scores in

these categories were near 100%. However, scores were very low in the categories of cooling/reheating and temperature control. It is significant that respondents do not seem to know basic facts about the conditions necessary for pathogen growth. More specifically, 37 of 42 or 88.1% of respondents did not know that cooked food can be held for a period of time without temperature control, while at the same time 35 of 42 or 78.6% knew that food should be held for service outside of the range of temperatures known as the “temperature danger zone”, or (TDZ). This seems to be a contradiction, and is important because it indicates that these food service workers may be memorizing facts for a test while failing to understand the concepts behind them. All food service workers should know why food temperature control is important, and some knowledge about the life cycles of the organisms that can make people sick.

Since this study was a replication, the results can be compared. They are of limited value of course, given the time difference between their administrations, the fact that the sample is one of convenience, and that there may be unknown error in the instrument. However, there are some similarities shown in the results. Most importantly, the results show agreement and disagreement in the same areas. In other words the results “track” each other. Also of interest is the fact that the respondents in the current study generally scored as high as or higher than the original study in all categories. One possible reason is that training may have improved overall.

5.3 Recommendations

Food borne illness is a serious concern to 100% of the world's population. Everyone has to eat to survive, so it is imperative that research continues the effort to find and minimize the risks associated with the foods we consume. Unfortunately, it is very difficult to properly assess the deficiencies inherent in our nutrition delivery systems, and within the scope of this study, it appears that temporary food vendors are quite reluctant to participate in the research. This could be because compliance with food codes can increase costs, and vendors may also feel that withholding information about their operations will avoid exposing possible violations that could adversely affect their success. It is recommended that in future research targeted at temporary food service establishments, added focus should be on improving the sample and increasing its size.

For questionnaires used in future research, care must be taken that questions are up to date and reflect the current knowledge base.

APPENDIX

Temporary Public Eating Places: Food Safety Knowledge and Practices



University of Missouri Hotel & Restaurant Management Program

You are being asked to participate in a survey research project entitled *Temporary Public Eating Places: Food Safety Knowledge and Practices,*” which is being conducted by Phil Neel, a student in the Masters Degree Program in Hotel and Restaurant Management at the University of Missouri. This survey is anonymous. No one, including the researcher, will be able to associate your responses with your identity. Your participation is voluntary. You may choose not to take the survey, to stop responding at any time, or to skip any questions that you do not want to answer. The questionnaire should take less than 10 minutes to complete. If you agree to participate, please put a check mark in the box after the consent statement and then complete the questionnaire.

I agree to complete the questionnaire and give consent to use the data collected.

Part 1 Food Safety Attitudes and Practices

Think about food safety attitudes and practices, and then respond to the following in terms of your own knowledge and training.

How do you feel about the following statements? Please rate each statement below by circling one of the numbers following it.

Key	
1 = Strongly Disagree	4 = Agree
2 = Disagree	5 = Strongly Agree
3 = Uncertain (Undecided)	

Here is an example:

Strongly

Disagree	Agree
<input type="text"/>	
(Circle your answer)	

My opinion is important.

1 2 3 4 5

By circling the number 5, this person indicates that he strongly agrees his opinion is important.

Strongly Disagree	Strongly Agree
<input type="text"/>	
(Circle your answer)	

1. Food handlers may smoke in food preparation and service areas.

1 2 3 4 5

Strongly Disagree	Strongly Agree
<input type="text"/>	
(Circle your answer)	

2. I believe that frequent and thorough hand washing is very important in keeping food safe to eat.

1 2 3 4 5

3. It is okay to thaw frozen food on the kitchen counter prior to preparation.

1 2 3 4 5

4. I can tell by my nose or taste when a food item would make a person sick. 1 2 3 4 5
5. Hot foods should be cooled to room temperature before being placed in the refrigerator. 1 2 3 4 5
6. I believe that a thermometer is a necessary tool in making sure that food is safe to eat. 1 2 3 4 5
7. In order to prevent food borne illness, previously cooked foods such as meat or poultry should be thoroughly reheated to 165°F or higher. 1 2 3 4 5
8. When I am in doubt about the safety of a previously cooked food, I throw it out rather than serve it. 1 2 3 4 5
9. I believe that a sanitizing agent should be used to clean the surfaces on which I prepare both raw and cooked foods. 1 2 3 4 5
- | Strongly Disagree | Strongly Agree |
|-------------------|----------------|
| | |
10. After handling raw meat or poultry, I always wash my hands with soap and water. 1 2 3 4 5
11. The size of the container is important when placing hot food in the refrigerator to be cooled. 1 2 3 4 5
12. When the room temperature is 90° or above, cooked food should not be left out longer than 1 hour before reheating or refrigerating and freezing. 1 2 3 4 5

13. I prepare and serve food here at work in the same manner I prepare and serve food at my home. 1 2 3 4 5

14. When I am at work preparing food, I always wear a clean apron and a hair restraint (hairnet or cap). 1 2 3 4 5

Part 2 Food Safety Knowledge True or False

In this section, circle the correct answer for each of the questions.

Here is an example:

Disposable gloves designed for one time use are called "single use gloves".

TRUE or FALSE or I'M NOT SURE

By circling the word TRUE this person indicates that he believes the statement is true.

15. Hot foods should be kept above 140°F and cold foods below 45°F.

TRUE or FALSE or I'M NOT SURE

16. You should keep raw meat, poultry, eggs, or fish separate from cooked foods during preparation.

TRUE or FALSE or I'M NOT SURE

17. You should prepare salads containing meat, poultry, eggs, or fish with pre-cooled ingredients whenever possible.

TRUE or FALSE or I'M NOT SURE

18. Cooked foods can be held at room temperature for several hours because the bacteria have been killed during cooking.

TRUE or FALSE or I'M NOT SURE

19. Dishes should be washed, rinsed, and sanitized, but kitchen equipment (such as slicers and grinders) need only be wiped off with a dampened sponge or cloth.

TRUE or FALSE or I'M NOT SURE

Part 3 Food Safety Knowledge Multiple Choice

In this section, circle one letter that best answers each of the questions.

Here is an example:

How should whole fresh salmon be packaged for delivery and storage?

- a. Layered with salt
- b. Vacuum sealed
- c. Wrapped in dry clean cloth
- d. Packed in self-draining crushed ice

By circling the letter d. this person has indicated that he thinks the best answer is:
Packed in self-draining crushed ice.

20. The maximum height of pans used to cool and store food in refrigerators should not be more than:

- a. 10 inches
- b. 8 inches
- c. 6 inches
- d. 4 inches
- e. 2 inches

21. Frozen foods should be received and stored at:

- a. 32°F
- b. 20°F
- c. 0°F

22. Employees with communicable diseases:

- a. May handle food if they wear gloves
- b. Should not handle food for as long as they are sick
- c. Have the right to decide the matter for themselves

23. How often should a food handler's hands be washed?

- a. Once each hour
- b. Before beginning work and after each rest break
- c. After every time contamination is a possibility.

24. When handling cooked foods, you should:

- a. Use plastic disposable gloves
- b. Use waxed paper
- c. Use forks, tongs, long handled spoons, or scoops
- d. Do any of the above
- e. Do none of the above; use your hands

Part 4 Demographic Information

This last section contains some questions about you.

25. What is your gender? (Circle only one)

- a. Female
- b. Male

26. What is your age? (Circle only one)

- a. Under 21
- b. 21 to 35
- c. 36 to 55
- d. 56 to 65
- e. 66 or older

27. What is your education level? (Circle only one)

- a. Primary school
- b. Some high school
- c. High school diploma or equivalent
- d. Some college
- e. Technical school or trade school certificate
- f. 2 year college degree
- g. 4 year college degree
- h. Some graduate school
- i. Graduate degree.

28. At how many temporary food service establishments have you worked? (Circle only one)

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5 or more

29. Have you prepared and served food at establishments that are other than temporary? (Circle only one)

- a. Yes
- b. No

If you answered no, skip to question 32.

30. For about how many years have you prepared and served food at establishments that are other than temporary?

(Circle only one)

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5 or more

31. At what kinds of food service operations (other than temporary) have you prepared and served food?

(Circle all that apply)

- a. Commercial restaurant
- b. Hospital/nursing home
- c. Fraternal/service club (Lions, Moose, Elks, etc.)
- d. School/college
- e. Fire station
- f. Church
- g. Other (Please specify below)

32. What kind of training or education have you had in preparing and serving food safely? (Circle all that apply)

- a. None
 - b. On the job by co-worker
 - c. On the job by supervisor
 - d. Formal class on the job
 - e. College course
 - f. Correspondence course
 - g. Local health department course
 - h. Other (please specify below)
-

Thank You!

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