Development and assessment of visual-based training on Chinese-speaking foodservice workers in independently-owned Chinese restaurants

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Development and assessment of visual-based training on Chinese-speaking foodservice workers in independently-owned Chinese restaurants

by

Dawei Li

A thesis submitted to the graduate faculty
In partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Hospitality Management

Program of Study Committee:
Lakshman Rajagopal, Major Professor
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2015

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ACKNOWLEDGMENTS

I would like to express my sincere gratitude to my committee chair Dr. Lakshman Rajagopal for his continuous guidance, support, encouragement, and motivation during my time at Iowa State University. He helped me throughout this journey. He created relentless opportunities for me such as encouraging me to work in ISU Dining, inviting me to audit his Servsafe class, allowing me to be his teaching and research assistant, involving me in an USDA project, recommending me to collaborate with the Iowa Department of Inspections and Appeals, and guiding me with thesis writing. I could not have imagined having a better advisor and mentor for my Masters study. Also, I would like to thank my committee members Dr. Susan W. Arendt and Dr. Angela M. Shaw for their guidance, patience, and support. I am very grateful for the funding I received from the Food Service Systems Management Education Council (FSMEC) to conduct my research. I also want to acknowledge the Iowa Department of Inspections and Appeals for their assistance with this study.

In addition, I would also like to thank my parents Gang Li, Ran Li, and Jingyu Liu for their constant emotional support and love. Heartfelt thanks to my colleagues, AESHM faculty and staff for making my time at Iowa State University a wonderful experience. I want to also offer my sincere appreciation to those individuals that were willing to participate in this research, without whom, this thesis would not have been possible.
ABSTRACT

In a two-phase study, food safety in independently-owned Chinese restaurants in Iowa was explored. In phase one, 28 food safety inspectors from the Iowa Department of Inspections and Appeals completed a web-based questionnaire assessing challenges with conducting food safety inspections in independently-owned Chinese restaurants. Language and cultural barriers were identified as major challenges when conducting food safety inspections in independently-owned Chinese restaurants. Use of training in Chinese language and visual-based tools were considered as useful in addressing language and cultural differences between food safety inspectors and Chinese-speaking foodservice workers. In phase two, 56 Chinese-speaking foodservice workers participated in visual-based minimal-text food safety training. Most participants had not received any food safety training in their workplace (93.0%) but more than 50% indicated they practiced safe food handling behaviors. After intervention, attitude scores increased by 17.1% and knowledge scores increased by 52.1%. Findings from this study have implications for food safety educators, researchers, and inspectors to improve communication with Chinese-speaking foodservice workers and convey food safety messages in an easy to understand and succinct manner. This in turn can improve safe food handling practices and reduce the incidence of foodborne illness in independently-owned Chinese restaurants.
CHAPTER 1: INTRODUCTION

Introduction

With total annual sales of $683.4 billion dollars, the United States (U.S.) restaurant industry is a major contributor to the country’s economy that employs around 13.5 million workers. The economic impact of the U.S. restaurant industry is estimated at $1.8 trillion (National Restaurant Association [NRA], 2014). In addition to being a significant part of the U.S. economy and employing a large number of workers, the restaurant industry also has a diverse workforce. Workers come from different walks of life, socioeconomic backgrounds, and countries. The restaurant industry employs more minority managers than any other industry and the number of Hispanic-owned and Asian-owned restaurants has increased significantly between 1997-2007 by 80% and 60% respectively. With the increasing workforce diversity of the restaurant industry, it has become essential to develop training and education programs that cater to the needs of diverse foodservice workers. A diverse workforce brings with them different attitudes, knowledge, and practices that can influence the manner in which foodservice workers handle food. Diverse food handling practices can have a negative impact on the health and well-being of consumers, and the restaurant.

Annually, contaminated food results in approximately 48 million cases of foodborne illness (U.S. Food and Drug Administration [FDA], 2013) that can lead to long-term health effects and deaths in the United States. According to the CDC’s Surveillance for Foodborne Disease Outbreaks, 48% of the foodborne disease outbreaks reported in 2009-2010 were associated with restaurants or
A foodborne illness is caused by food that has been contaminated with biological, chemical, or physical contaminants. Contamination can occur at one or more places during the flow of food – the path food takes from the purchasing/receiving step until service. According to the FDA (2006), the five most common food handling mistakes are: poor personal hygiene, improper time-temperature control, cross-contamination, using contaminated equipment, and purchasing food from unsafe sources; with the highest non-compliance rates observed with improper holding/time and temperature abuse, poor personal hygiene, and cross contamination. In comparison of health inspection reports of schools and restaurants by Kwon, Roberts, Sauer, Cole, and Shanklin (2014) found restaurants to be 3.6 and 3.0 times more likely to be cited for behavioral violations (ex: use of single-use gloves, date marking foods) and critical violations (ex: protecting food from contamination, time and temperature control) respectively. These food-handling mistakes can be found in ethnic and non-ethnic restaurants.

Kwon, Roberts, Shanklin, Liu, and Yen (2010) found restaurant inspection scores to be lower in ethnic-owned restaurants than in non-ethnic restaurants, a finding that has been corroborated by other researchers (Harris, Murphy, DiPietro, & Rivera, 2015; Hedberg, 2006; Jones, Pavlin, LaFleur, Ingram, & Schaffner, 2004). Ethnic restaurants have been associated with more foodborne illness outbreaks (FBO) than non-ethnic restaurants (Buchhols, Run, Kool, Fielding, & Mascola, 2002; Franco & Simonne, 2009; Hedberg et al., 2006, Rudder, 2006;
Simonne, Nille, Events, & Marshall, 2004). A study of food safety practices in ethnic independent and chain restaurants, and non-ethnic independent and chain restaurants found lower food safety compliance in ethnic independent and chain restaurants (Roberts, Kwon, Shanklin, Liu, & Yen, 2011). The reasons for this difference could be due to lack of knowledge, lack of motivation, lack of risk perception, lack of time, and/or lack of resources to practice food safety (i.e., unavailability of thermometers or poor access to handwashing sinks). The concept of a food safety culture that examines the role of “organizational culture” in supporting employees by providing the tools to practice food safety has recently received a lot of attention (Abidin, Arendt, & Strohbehn, 2013; Neal, Binkley & Henroid, 2012; Ungku, Strohbehn, & Arendt, 2014; Yiannas, 2010). Language barriers are also a major impediment towards understanding and practicing food safety (Bermúdez-Millán, Pérez-Escamilla, Damio, González, & Segura-Pérez, 2004; Rudder, 2006).

Among ethnic cuisines, Chinese cuisine has been identified as the most preferred ethnic cuisine in the U.S. followed by Mexican, Japanese, and Thai cuisine (Lee, Niode, Simonne, & Bruhn, 2012). With the increasing popularity of Chinese food among consumers, maintaining the safety of food served at Chinese restaurants is critical for preventing incidences of foodborne illness. This study particularly focused on independently-owned Chinese restaurants in the state of Iowa. Efforts were made to recruit food safety inspectors with experience in conducting food safety inspections in independently-owned Chinese restaurants (Phase 1) and Chinese-speaking foodservice workers (Phase 2) who were Chinese
immigrants whose native language was Mandarin Chinese and who had limited or no English skills. This study aimed to assess food safety inspectors’ views on food safety needs in independently-owned Chinese restaurants; and develop and assess the effectiveness of visual-based minimal-text food safety training in improving food safety attitudes and knowledge of Chinese-speaking foodservice workers.

**Significance of Study**

Researchers have explored food safety training needs of ethnic restaurants in many ways such as: examination of restaurant food safety inspection data (Harris, Murphy, DiPietro, & Rivera, 2015; Kwon, Choi, Liu, & Lee, 2012; Kwon, Roberts, Shanklin, Liu, & Yes, 2010; Roberts, Kwon, Shanklin, Liu, & Yen, 2011;), the effect of Chinese Cultural Values (CCV’s) of Chinese restaurateurs on attitudes and behaviors towards food safety training (Liu & Kwon, 2013). However, no known research has explored food safety inspectors’ views on food safety needs when conducting food safety inspections in independently-owned Chinese restaurants, and the effect of visual-based minimal-text food safety training on food safety attitudes and knowledge of Chinese-speaking foodservice workers working in independently-owned restaurants in the state of Iowa.

This study builds upon previous research studies that have examined food safety needs of foodservice workers (ethnic and non-ethnic) and the impact of visual-based minimal text training on food safety attitudes and knowledge of foodservice workers. It was expected that a number of food safety issues would be identified by food safety inspectors in independently-owned Chinese
restaurants that would highlight “food safety gaps” that can be addressed through training. The ultimate goal of this study was to develop a visual-based minimal-text food safety training that addresses the food safety needs identified by food safety inspectors in independently-owned Chinese restaurants.

This research utilized two questionnaires a) an open-ended questionnaire with food safety inspectors in phase one, and a) a questionnaire assessing attitudes and knowledge before and after visual-based minimal-text food safety training in phase two. This approach allowed the researcher to investigate the food safety needs in independently-owned Chinese restaurants from the viewpoint of food safety inspectors and develop food safety training that could be used to train Chinese-speaking foodservice workers in independently-owned Chinese restaurants in Iowa.

**Objectives of the Study**

The purpose of this study was to assess food safety inspectors’ views on food safety needs of Chinese-speaking foodservice workers employed in independently-owned Chinese restaurants in Iowa, and then develop and test the effectiveness of visual-based minimal-text food safety training materials on food safety attitudes and knowledge of Chinese-speaking foodservice workers. The specific research objectives for the study were:

1) Evaluate food safety inspectors’ views on food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants.
2) Assess food safety attitudes, knowledge, practices, and training received by Chinese-speaking foodservice workers in independently-owned Chinese restaurants.

3) Develop and evaluate the effectiveness of visual-based, minimal-text training materials on the food safety attitudes, knowledge, and practices of Chinese-speaking foodservice workers in independently-owned Chinese restaurants.

**Definition of Terms**

**Critical violations:** food handling practices when done improperly, are most likely to lead to foodborne illnesses such as cooking, cooling, storing and serving food incorrectly (FDA, 2013).

**Foodborne illness:** an illness caused by eating contaminated food (CDC, 2014).

**Foodborne illness outbreak:** an incident in which two or more persons experience a similar symptom/illness resulting from the ingestion of a common food (CDC, 2014).

**Food allergy:** the body’s negative immunological reaction to proteins in food (Food Allergy Research & Education [FARE], 2015).

**Flow of food:** the path food takes in a foodservice establishment from purchasing/receiving until serving (ServSafe, 2014).

**Independently-owned restaurant:** restaurant owned by an individual, a family, or a group of people, and is the only one of its kind (Gregoire, 2012).

**Non-critical violations:** practices that are primarily maintenance and sanitation issues that are not likely to be the cause of foodborne illness (FDA, 2013).
Organization of Thesis

This thesis contains six chapters. Chapter one is an introduction to the study objectives, hypotheses, and definition of terms. Chapter two is a review of literature. Chapter three outlines the methodology used in this study. Chapter four is a manuscript that will be submitted to the Journal of Foodservice Management and Education. Chapter five is a summary of the results and discussion of phase 2. Chapter six is an overall summary and general conclusions of this study. I was involved in all stages of this research thesis from conception to writing. Dr. Rajagopal served as my major professor and provided guidance at every step in the research process. Drs. Susan W. Arendt and Angela M. Shaw served as committee members and provided valuable input on all aspects of this thesis.

References


CHAPTER 2. REVIEW OF LITERATURE

Foodborne Illness in the United States

Foodborne illness is an illness caused by eating contaminated food. Foodborne illnesses often present flu-like symptoms, such as nausea, vomiting, diarrhea, and fever. Many people may not recognize their illness was caused by food they consumed. A “foodborne illness outbreak” is defined as “an incident in which two or more persons experience a similar illness resulting from the ingestion of a common food” (Centers for Disease Control and Prevention [CDC], 2014). Although the American food supply is among the safest in the world, the U.S. Food and Drug Administration (FDA) estimates there are about 48 million cases of foodborne illness annually (FDA, 2013). Every year contaminated food results in a significant number of illnesses and deaths in the United States (U.S).

Improving food safety and reducing foodborne illness is among the top topics of the Healthy People 2020 Initiative (U.S. Department of Health and Human Services, 2010). The goals of the Healthy People 2020 initiative are to:

- Attain high-quality, longer lives free of preventable disease, disability, injury, and premature death.
- Achieve health equity, eliminate disparities, and improve the health of all groups.
- Create social and physical environments that promote good health for all.
- Promote quality of life, healthy development, and healthy behaviors across all life stages.
Annually, known disease-causing agents in food cause an estimated 9.4 million illnesses, 55,961 hospitalizations, and 1,351 deaths (Scallan et al., 2011b), and unknown disease-causing agents cause an additional 38.4 million illnesses, 71,878 hospitalizations, and 1,686 deaths (Scallan et al., 2011a). While, foodborne illness can affect anyone, individuals belonging to the EPIC population (elderly, pregnant, immune-compromised, and children) are at a higher risk of contracting a foodborne illness due to their weaker immune systems. Along with the number of individuals affected by foodborne illness, significant economic burden results from contracting a foodborne illness. Foodborne pathogens result in over $15.5 billion in economic burden (Hoffman, Maculloch, & Batz, 2015).

Campylobacter spp., Clostridium perfringens, Cryptosporidium spp., Cyclospora cayetanensis, Listeria monocytogenes, Norovirus, Salmonella non-typhoidal species, Shigella spp., STEC O157, STEC non-O157, Toxoplasma gondii, Vibrio vulnificus, Vibrio parahaemolyticus, Vibrio other non-cholera species, and Yersinia enterocolitica cause 95% of foodborne illness in the U. S. Surveillance data collected from the Centers for Disease Control and Prevention’s (CDC) Foodborne Disease Outbreak Surveillance System from 1998-2008 identified restaurants or delis (68%), private homes (9%), and catering or banquet facilities (7%) as common places from where foodborne outbreaks (FBO’s) originate (Gould et al. 2013); underscoring the importance of maintaining food safety at foodservice establishments to reduce/prevent the incidence of foodborne illnesses.
The Restaurant Industry in the United States

The restaurant industry is a significant segment of the U.S. economy that provides jobs to millions of workers. The industry’s annual sales in 2014 totaled $683.4 billion. On a typical day restaurant industry sales are $1.8 billion across the 990,000 restaurant locations nationwide and constitutes 4% of the country’s Gross Domestic Product (GDP). The industry’s share of the U.S. food dollar is 47%. Each dollar people spend in restaurants generates two dollars in sales for other industries. The total economic impact of the industry is estimated at $1.8 trillion. Today, there are more than 13.5 million employees working in the restaurant industry and this is expected to increase by 9.8% to 14.8 million over the next decade. One in ten Americans is employed in the restaurant industry, and one in three Americans obtains their first work experience in a restaurant. People are employed as waiters and waitresses (20.4%), cooks (26%), and food preparation workers (7.0%) (National Restaurant Association [NRA], 2014).

The restaurant industry employs a workforce that is diverse. The average age of foodservice employees is 29.3 years (NRA, 2014). The restaurant industry employs more minority managers than any other industry and the number of Hispanic-owned and Asian-owned restaurants has increased significantly between 1997-2007 by 80% and 60% respectively. Women (59%), Black or African American (14%), and Hispanics (14%) are employed as first-line supervisors/managers in restaurants. Hispanic-owned businesses have grown tremendously by 188% between 1997 and 2007. Women-owned restaurants have increased by 50% from 1997 to 2007. The industry provides extensive career
training for entry-level workers, students, and military veterans (NRA, 2014). As the workforce diversity continues to increase, there is a need for training and education of food handlers using methods that convey critical messages in a culturally sensitive manner.

Dining out has become a part of the American lifestyle. People choose to eat out for a number of reasons. Nine in ten consumers said they enjoy going out to eat at restaurants. (NRA, 2014). One of the reasons for the increase in dining out could be generational differences between Baby Boomers, Generation X, and Y, and the difference in knowledge of food preparation at home (Salt, 2003; Sloan, 2003). As of 2010, the percentage of population aged 65 or higher is 13% and is expected to reach 21% by 2050. As increasing numbers of Americans continue to dine out, and the diversity of clientele increases; the development, implementation, and monitoring of policies and procedures for maintaining food safety is critical for public health and wellbeing.

**Food Safety in the Restaurant Industry**

According to the CDC’s Surveillance for Foodborne Disease Outbreaks, 48% of the foodborne disease outbreaks reported in 2009-2010 were associated with restaurants or delicatessens-including cafeterias and hotels, (CDC, 2013). According to Jones and Angulo (2006) foodborne illnesses can be caused by any food that is contaminated with biological, chemical, or physical contaminants. Contamination can occur at one or more places in the foodservice establishment as food moves during the “flow of food” from purchasing and receiving, storage, preparation, holding, cooling, reheating, and serving, (ServSafe, 2012). If
foodservice employees do not handle food safely during any of these steps, food can become unsafe for consumption. In addition to these three types of contaminants that contribute to foodborne illness, up to 15 million Americans with food allergies can also be affected by accidental ingestion of food allergens when dining out (Food Allergy Research & Education [FARE], 2014). Therefore, the health risks of improper food handling in foodservice operations can have a negative impact on consumers.

Five of the most common food handling mistakes include; poor personal hygiene, improper time-temperature control, cross-contamination, using contaminated equipment, and purchasing food from unsafe sources (FDA, 2006). With the exception of purchasing food from an unsafe source, each mistake listed above is related to four main factors: time-temperature abuse, cross-contamination, poor personal hygiene, and poor cleaning and sanitizing.

Researchers have highlighted the role of environmental factors such as irrigation, soil, and on-farm handling practices on contamination of food (Barker-Reid, Harapas, Engleitner, Kreidl, & Faggian, 2009; Franz, & Vanruggen, 2008). However, an examination of literature review on food handling practices points towards improper food handling and poor personal hygiene as major factors that influence food safety along with other risk factors identified by the CDC (CDC, 2006). Research has found that employees often know the correct behaviors to use; but lack of motivation or other barriers prevent adherence to correct food handling practices (Chapman, Eversley, Fillion, MacLaurin, & Powell, 2010; Ellis, Arendt, Strohbehn, Meyer, & Paez, 2010; Frash & MacLaurin, 2010;
Observational research of food handling practices of foodservice workers has shown that foodservice workers frequently employ unsafe food handling practices (Clayton & Griffith, 2004; Clayton & Griffith, Price, & Peters, 2002; Green et al, 2006; Green & Selman, 2005; Rajagopal & Strohbehn, 2013; Roberts et al, 2008; Strohbehn, Sneed, Paez, & Meyer, 2008).

Restaurants are inspected for safety and sanitation by the state’s Department of Inspections and Appeals at least once a year depending on the type of restaurant or history of violations. Food safety inspectors play a critical role in evaluating foodservice establishments in order to ensure restaurants are following the standards outlined in the Food Code (FDA, 2013). The Food Code is recommended by the FDA and aims to achieve the following: “a) reduction of the risk of foodborne illnesses within food establishments, thus protecting consumers and industry from potentially devastating health consequences and financial losses, b) uniform standards for retail food safety that reduce complexity and better ensure compliance, c) the elimination of redundant processes for establishing food safety criteria, d) the establishment of a more standardized approach to inspections and audits of food establishments”.

Most issues with foodborne illnesses can be addressed by avoiding the top five risks for foodborne illness (FDA, 2013) rather than overtly relying on food safety inspections for enforcement of food safety regulations. Restaurants may view food safety inspectors as “outsiders” which can create resistance and fear
(Reske, Jenkins, Fernandez, VanAmber, & Hedberg, 2007) or language barriers can affect interaction with the food safety inspector and comprehension of food safety issues identified. These might be more prevalent among foodservice personnel who are non-English speaking immigrant restaurant staff.

**Ethnic Restaurants in the United States**

The U.S. foodservice industry is one of the most diverse industries in the United States. It employs more minority managers than any other industry, and more than one-quarter of all foodservice managers are foreign-born (NRA, 2014a). The demographic landscape of the U.S. has changed significantly in recent years because of an increase in immigration and globalization. While Hispanics are the largest minority in the U.S., Asians became the fastest growing demographic in the U.S. during the period of 2000 to 2010, increasing by 43% by 2010. It is estimated that the Asian population will grow from 14.1 million in 2010 to 34.4 million by 2050 (U.S. Census Bureau, 2010).

As the ethnic population increases and the number of ethnic restaurants increase, more Americans are becoming interested in and exposed to foods from different cultures. Mintel (2014) showed that diversity in the U.S. population strongly contributes to the growth of ethnic restaurants. Ethnic foods have become more familiar to Americans, and international cuisines are increasingly viewed as important flavor alternatives as they provide unique regional experiences without having to travel to distant countries. Currently, the most popular ethnic cuisines in the U.S are Mexican, Italian, and Asian (primarily Chinese and Japanese) (Lee, Hwang, & Mustapha, 2014). With the increasing diversity of the workforce and
increase in the number of ethnic restaurants; evaluation of food handling practices among ethnic food handlers is essential to maintain uniformity in food safety practices in all ethnic restaurants for safeguarding public health and keeping restaurants in business.

**Food Safety in Ethnic Restaurants**

Foodborne outbreaks have been associated with ethnic restaurants serving Mexican, Italian and Asian foods. A study conducted by Kwon, Roberts, Shanklin, Liu, and Yen (2010) showed that restaurant inspection scores were lower in sanitation parameters for ethnically owned restaurants than for non-ethnically owned restaurants. Not sure if this is what you mean Ethnically-owned restaurants had an average of 2.2 critical violations, and 4.7 non-critical violations, as opposed to 0.8 critical violations and 2.8 non-critical violations for non-ethnically owned (non-ethnic could be confused with non-ethnic food rather than non-ethnically owned) restaurants. Similar results were observed by other researchers who investigated foodborne disease outbreaks or food safety inspection reports of ethnic restaurants (Buchholz, Run, Kool, Fielding, & Mascola, 2002; Franco & Simonne, 2009; Harris, Murphy, DiPietro, & Rivera, 2015; Hedberg et al., 2006, Jones, Pavlin, LaFleur, Ingram, & Schaffner, 2004; Roberts, Kwon, Shanklin, Liu, & Yen, 2011; Rudder, 2006; Simonne, Nille, Events, & Marshall, 2004).

Foodborne illness data associated 2727 cases of outbreaks due to *Salmonella*, Norovirus, *Clostridium perfringens*, *Campylobacter jejuni*, *Bacillus cereus*, and *E. coli* O157:H7 in Mexican restaurants. One hundred and thirteen
cases of outbreaks were found to be due to *Bacillus cereus*, Norovirus, *Campylobacter jejuni*, *Staphylococcus aureus*, and *Campylobacter* in Chinese restaurants. Three hundred and thirty-six cases of outbreaks were linked to Norovirus, *Staphylococcus aureus*, *Bacillus cereus*, *Clostridium perfringens*, and *Salmonella enterica* in Italian restaurants. While 298 cases of outbreaks were found due to *Salmonella enterica*, Norovirus, *Bacillus cereus*, *Campylobacter*, and *Staphylococcus aureus* in Japanese restaurants (Lee, Hwang, & Mustapha, 2014). Improper time and temperature control of potentially hazardous foods, improper physical facility maintenance, inadequate prevention of contamination (physical, chemical, and biological), and poor handwashing hygiene have been identified as major violations.

Arendt et al. (2011) found inconsistent or unclear messages, lack of rewards/discipline, lack of resources, and lack of motivation as some reasons for not practicing food safety. However, if management provides appropriate support, it can make a significant difference in improving food safety. Support can be provided in terms of a) formal training such as lectures, b) informal training (posters and on-the-job training), and c) providing resources for practicing food safety (example: easier access to handwashing sinks and gloves); thereby promoting a culture of food safety (Yiannas, 2010). Research has shown that obtaining food safety certification correlated with higher food safety knowledge among foodservice managers and foodservice workers (Manes et al., 2013; Lynch et al., 2003; DeBess et al., 2009), however those managers with little to no knowledge of English or limited English reading comprehension had trouble
understanding food safety concepts and passing the food safety certification exam (Brown, 2014). Additional factors that were found to correlate with higher food safety knowledge were years of foodservice work experience, employment in chain restaurants, and being responsible for many tasks.

**Influence of Culture on Food Safety Practices**

According to the Cultural Theory (Douglas & Wildavsky, 1982) “perceptions of risk are influenced by particular forms of social organizations or social institutions. Each social institution has its own “worldviews or ideologies entailing deeply held values and beliefs defending different patterns of social relations”. (p. 93)

Therefore, “risks are socially constructed and viewed differently depending upon the worldview to which one adheres” (Knight & Warland, 2005). According to Hollingsworth (2003), among ethnic groups originating from different countries, cultural differences are influenced by their educational and economic circumstances along with the amount of assimilation into the foreign culture. The level of acculturation can also influence food preferences, purchasing, cooking practices, and food consumption patterns (Pugesek, 2007).

Traditional food handling practices are rooted in the culture and traditions of foodservice managers and workers and they differ from those recommended by food safety professionals which can also impede adherence to safe food handling practices. Studies have suggested that these differences manifest as language barriers, low-risk perception, and lack of knowledge and understanding of food safety as major challenges to practicing food safety among ethnic workers in
Food Safety Training

Food safety training is an effective way to prevent foodborne disease outbreaks. Education is important and can assist in bridging cultural gaps in food safety knowledge and attitudes (Toh & Birchenough, 2000). According to a study conducted by Worsfold and Griffith (2003), evaluations of caterers’ personal hygiene knowledge, perceptions of their risks regarding food safety, and their attitudes towards Hazard Analysis of Critical Control Points (HACCP) were compared before, during, and after training. The results indicated an improvement in awareness and knowledge about HACCP after training. Samples were collected from four school kitchen salads, including samples obtained before and after the staff had received training about food handlers’ hygiene practices. Comparing these four samples showed that the number of bacteria in the food samples decreased significantly after training (Martinez-Tome et al., 2000).

In a study of independent delicatessens in New Jersey; microbial analysis, informal field observations, and review of inspection reports found widespread microbial contamination from *E.coli* and *Staphylococcus aureus*, numerous violations and poor food handling practices indicating that food from independent foodservice establishments are more contaminated than those from chain restaurants (Murray, Feldman, Lee, & Schuckers, 2013). Chain restaurants may have better food safety controls in place because of available resources and adoption of standardized food handling practices that independent restaurant
owners may not have. It is advisable for independent restaurants to attempt adopting the approaches used by chain restaurants to maintain food safety and sanitation as much as they can. However, the safety of food prepared in ethnic chain restaurants has been found to be lower than food prepared in non-ethnic chain and independent restaurants (Roberts, Kwon, Shanklin, Liu, & Yen, 2011).

Researchers have reported food safety training as being effective in increasing sanitation inspection scores (Cotterchio, Gunn, Coffill, Tormey, & Barry, 1998; Noble, Griffith, Thompson, & MacLaurin, 2009; Smith & Shillam, 2000). Lack of resources, expenses, time constraints, and the attitudes of the employees were identified as major barriers to providing adequate food safety training to restaurant employees (Roberts et al., 2008; Youn & Sneed, 2002). In addition, the Food Code requires the person in charge at the foodservice establishment (typically the manager) to possess food safety certification (FDA, 2013); it is then expected that the manager will share food safety knowledge with the workers through formal and/or informal training. However, food safety certification regulations have been found to vary throughout the U.S. (Almaza & Nesmith, 2004). In a study conducted by Niode, Bruhn, and Simonne (2010), Hispanic and Asian restaurant managers indicated their foodservice staff did not always follow food safety practices and the managers did not feel non-compliance with food safety guidelines would lead to consequences. These issues highlight the need to explore food safety practices in ethnic restaurants and examine the role of management (Griffith et al., 2010; Yiannas, 2010) on food safety practices.
In a study by Burke et al. (2006), 95 quasi-experimental studies (n=20,991) were included for analysis. Three types of interventional methods were distinguished on the basis of learners’ participation in the training process: least engaging (lecture, pamphlets, and videos), moderately engaging (programmed instruction and feedback interventions), and most engaging (training in behavioral modeling and hands-on training). As training methods became more engaging—i.e., requiring trainees’ active participation—workers demonstrated greater knowledge acquisition, and reductions were seen in accidents, illnesses, and injuries. All methods of training produced meaningful behavioral performance improvements. Training involving behavioral modeling, an adequate amount of practice, and substantive dialog is generally more effective than other methods of safety and health training. A table-top/counter-top training program made up of visuals, visual aids, and short, succinct messages was found to be successful in training Spanish-speaking retail employees about food safety with improvements seen in food safety knowledge and skill (Richard et al., 2013). Hence, use of interactive training is helpful in improving and retaining knowledge. However, according to Allport (1935) “people first acquire information about a behavior, which leads to the development of attitudes, which then leads to a behavior that is in agreement with the attitude”.

**Food Safety Training in Ethnic Restaurants**

Food safety training has been identified as a way to enhance food safety in restaurants and reduce the incidence of FBO’s. However, food safety training that acknowledges different cultures and learning styles is currently inadequate even
though the percentage of foreign workers in ethnic restaurants is relatively high, and ever increasing compared to non-ethnic restaurants with more than one-quarter of all foodservice managers being foreign-born. Po (2007) pointed out that ethnic restaurant food handlers’ limited ability to speak adequate English and other cultural factors may cause difficulties in communication with food safety inspectors. Po et al. (2011) also pointed out that appropriate translation and culturally appropriate or sensitive approaches to food safety are required for effective food safety education training for ethnic food handlers.

Cho et al. (2012) argued that Latino(a) restaurant employees tend to follow more appropriate food safety practices when food safety training focuses on the benefits to their restaurants, because the cultures of Mexico and other Latin American countries are based on collectivism. It needs to be taken into consideration that Latino/a workers are more interested in the group, family, and extended relationships than individual ones; which is the same for the Chinese. Thus, food safety training for ethnic restaurant handlers can be effective in preventing foodborne illness if cultural and familial components are reflected and included within training efforts. Providing training will ensure all foodservice workers from participating restaurants become aware of the latest Food Code regulations and translate the knowledge to safe food handling behaviors. Also providing intrinsic and extrinsic motivational resources can improve food safety practices among foodservice workers (Ellis, Arendt, Strohbehn, Meyer, & Paez, 2010).
One method by which food safety training can be provided is by using minimal-text visuals when training minorities for whom English is not their first language. Panchal, Liu, and Dworkin (2012) emphasized the need for targeted food safety educational materials in English and Spanish to address language barriers. Appropriate translation and visual aids help overcome language barriers and relay critical food safety messages in short and more easily understood ways. Visually-based training along with hands-on activities were found to be effective in training Spanish-speaking foodservice workers about safe food handling practices, resulting in significantly improved food safety knowledge scores (Rajagopal, 2012; 2013). Rajagopal and Strohbehn (2013) observed an improvement in glove use behaviors among students employed in university dining after implementation of a visual-based, minimal-text poster. Additionally, visual-based training can also help foodservice workers who are born in the U.S.

Dworkin, Pratap, Jackson, and Chakraborty (2015) found culturally-tailored “photonovella” to be effective in increasing food safety knowledge and behavior of African Americans from low socioeconomic background about meat and poultry handling. The photonovella was a storybook with pictures taken of volunteer participants who were handling food improperly in different situations, and critical food safety messages were conveyed. A training program that employed a blended delivery method and taught at the middle school level of reading, was preferred by front-line employees (Howton, 2016). A survey by the National Assessment of Adult Literacy (2007) found that 14% of American adults had below basic literacy levels, far below the level needed to earn a living wage.
and 22% had basic literacy levels. Therefore, visual-based, minimal-text visuals can be helpful for training both ethnic and non-ethnic foodservice workers.

**Chinese Restaurants in the United States**

Most Chinese restaurants are single-unit, independently-owned foodservice operations (Chen & Bowen, 2001). Although limited, a few brands, such as P.F. Chang’s, China Bistro and the Panda Express are gaining popularity as Chinese chain restaurants in the U.S. Chinese restaurants are typically operated using family members as employees (Liu & Jang, 2009). Chinese restaurants have been in business within Chinese communities in the U.S. since the mid-19th century. At the beginning, Chinese communities were the major customers patronizing Chinese restaurants. Over the course of time, more immigrants opened their restaurants and adjusted their flavors to the American palate. Customers quickly accepted Chinese restaurants and the restaurants performed well in the ethnic restaurant segment. Chinese food can be categorized by the region from which it originates, in particular; Canton, Shanghai, Beijing, and Hunan/Szechuan. Canton cuisine originates in the southern area of China and emphasizes frying, roasting, steaming, and poaching (Roberts, 2004).

Chinese food has been identified as the most preferred ethnic cuisine in the U.S. followed by Mexican, Japanese, and Thai cuisine (Lee, Niode, Simonne, & Bruhn, 2012). Chinese Restaurant News (2008) stated there are more than 46,000 Chinese restaurants in the U.S., which is, perhaps surprisingly, twice the number of McDonald’s restaurants. The annual sales of Chinese restaurants reached over $20 billion in 2008, accounting for 5.0% of total food and drink
sales in the U.S. Because of the rapid development and expansion of the U.S. restaurant industry, Chinese restaurants have been facing competition from other restaurants, including other Asian restaurants, such as Indian, Japanese, Korean, Thai, and Vietnamese (Liu & Jang, 2008). However, Chinese cuisine still dominates the Asian restaurant market.

With the increasing popularity of Chinese food among consumers, maintaining safety of the food served at Chinese restaurants is critical for preventing incidences of foodborne illness. Education and training using culturally appropriate, relevant tools along with providing a supportive food safety culture might improve comprehension of food safety concepts and encourage safe food handling practices among Chinese foodservice workers. Visual-based videos and picture-based training can also help Chinese-speaking foodservice workers better understand food safety messages. Liu and Kwon (2013) found that Chinese foodservice workers preferred to receive food safety training through videos and materials translated in Chinese.

Given the paucity of research on food handling practices of Chinese-speaking foodservice workers in Chinese restaurants; exploration of food safety needs in Chinese restaurants and the effect of visual-based, minimal text food safety training on food safety attitudes and knowledge of Chinese-speaking foodservice workers in independently-owned restaurants was conducted.
References


CHAPTER 3. METHODS

Purpose of Study

The purpose of this study was to explore food safety inspectors’ views on food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants; and develop and test the effectiveness of visual-based, minimal-text food safety training materials on food safety attitudes and knowledge of Chinese-speaking foodservice workers.

Research Objectives

The specific research objectives of this study were to:

1) Evaluate the food safety needs of Chinese-speaking foodservice workers in independently owned Chinese restaurants as viewed by food safety inspectors.


3) Develop and evaluate the effectiveness of visual-based, minimal-text training materials on food safety attitudes and knowledge of Chinese-speaking foodservice workers in independently-owned Chinese restaurants.

Use of Human Subjects

Iowa State University’s Institutional Review Board for Human Subjects Research approved the research protocol and data collection instruments prior to recruitment and data collection (Appendix A). All researchers involved in this study have completed Iowa State University’s Human Subjects Research Training.
Research Design

This study consisted of two phases. Phase one involved administration of a web-based questionnaire to a sample of food safety inspectors to assess their assessment of food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants. In phase two, visual-based minimal-text food safety training materials were developed and its effectiveness on food safety attitudes and knowledge of Chinese-speaking foodservice workers was assessed before and after training.

Sample selection

In phase one, food safety inspectors (n=45) employed with the Iowa Department of Inspection and Appeals with experience conducting food safety inspections in independently-owned Chinese restaurants were recruited from six regions in Iowa (North West, North East, South West, South East, East Central and Central) (Appendix B). In phase two, participants (n=60) who were immigrant foodservice workers and whose native language was Mandarin Chinese were recruited from independently-owned Chinese restaurants that were within 50 miles of Ames, Iowa (n=16) through phone calls (Appendix G and H) and flyers (Appendix I). Independently-owned Chinese restaurants were chosen because workers and managers at these establishments may have different food safety attitudes, knowledge, standards, and practices than Chinese chain restaurants (Example: P.F. Chang’s or Panda Express). A study of food safety practices in ethnic independent and chain restaurants, and non-ethnic independent and chain restaurants found lower food safety compliance in ethnic independent
and chain restaurants (Roberts, Kwon, Shanklin, Liu, & Yen, 2011). These differences could be due to a lack of managerial or coworker support, low-risk perception, lack of knowledge, lack of resources (such as gloves, thermometers) to practice safe food handling or others reasons.

**Data collection**

For phase one, a web-based open-ended questionnaire was developed and administered to food safety inspectors (n=45) in the state of Iowa. The questionnaire was posted online using the survey management software - Qualtrics©. In phase two, Chinese-speaking immigrant foodservice workers (n = 60) whose native language was Mandarin Chinese were recruited from independently-owned Chinese restaurants (n = 16) in Central Iowa through phone calls and flyers. All participants provided informed consent prior to participation (Appendix B and F).

**Development of Minimal-Text Visual-Based Food Safety Training Materials and Survey Questionnaires**

The phase one questionnaire consisted of 13 open-ended questions (Appendix E). The questionnaire was designed to elicit information about food safety inspectors’ experiences, observations of food safety practices, and cultural barriers faced when conducting food safety inspections in independently-owned Chinese restaurants. The questionnaire was reviewed by experts (n=3) in food safety and foodservice operations for content, construct, and face validity, and then pilot-tested with food safety inspectors (n=2) for clarity and content. Food safety inspectors that participated in the pilot study were excluded from the main
study. Feedback obtained from the pilot-study was used to improve the questionnaire for clarity, prior to distribution. An invitation email containing a link to the questionnaire was sent to all participants listed in the mailing list provided by the Iowa Department of Inspections and Appeals (Appendix C). Reminder emails were sent at week 1, 2, and 3 (Appendix D).

For phase two, the training materials and questionnaire were developed in English and reviewed by experts (n=3) in food safety and foodservice operations for content, construct, and face validity. Training materials and the questionnaire were translated into Mandarin Chinese then translated into English for accuracy and readability by a person (n=1) with experience in foodservice and food safety. The paper-based questionnaire and the training materials were evaluated by a convenience sample of Chinese-speaking foodservice workers employed in university dining (n=5) who received $10 for their participation (Appendix F, G, & H). Evaluators provided feedback to identify strengths, weaknesses, assess clarity, and suggested ways to improve the materials (Appendix J). The questionnaire developed by Lin and Sneed (2005) was modified to reflect the current Food Code used in Iowa along with feedback obtained in phase two (Appendix K). Each correct answer received one point and each incorrect answer received a zero for a total possible food safety knowledge score of 30.

Minimal-text visual food safety training materials previously developed by researchers (Arendt, Strohbehn, Rajagopal, Sauer, & Shaw, 2015; FDA, 2006; Rajagopal 2012, 2013; Rajagopal & Strohbehn, 2012) were modified to reflect the 2009 Food Code and the 2011 supplement (U.S. FDA, 2009, 2011) (Appendix M-
which is currently adopted in the state of Iowa. Additional training materials were developed based on findings from phase one. The training materials specifically focused on educating Chinese-speaking foodservice workers about preventing the top five risk factors that contribute to foodborne illness (FDA, 2013): poor personal hygiene, improper time-temperature control, cross-contamination, contaminated equipment and surfaces, purchasing food from unsafe sources. Training materials about food allergies and allergen handling were also developed because food allergies are on the rise (FAAN, 2014). The “flow of food” was used as the framework for this training.

**Training Sessions**

Training sessions lasting approximately three hours were conducted in Mandarin Chinese at selected independently-owned Chinese restaurants (n=16) in Iowa during non-working hours. Permission was obtained from restaurant managers to conduct training at their restaurant. Trainings were conducted with the aid of developed training materials, videos (example: HandwashingforLife® video), and hands-on activities such as: using GloGerm™ to demonstrate proper handwashing technique, calibrating a food thermometer, and preparing cleaning and sanitizing solutions. Questionnaires were administered before and after training to assess the effectiveness of the minimal-text visual-based training. Participants were encouraged to ask questions or share their experiences about food safety practices and observations to enhance the learning process.
An overview of the training sessions is shown below:

a. Introduction to the workshop.

b. Completion of the informed consent form and pre-training questionnaire.

c. Overview of foodborne illness and safe food handling practices.

d. Use of GloGerm™ to teach participants about proper handwashing technique.

e. Calibration of a food thermometer and measurement of food temperature.

f. Preparation of cleaning and sanitizing solutions.

g. Completion of post-training questionnaire.

Refreshments were provided at all training sessions. All participants received a $10 gift card for groceries, a food thermometer, and handouts of training materials as appreciation for their participation.

Data analysis

For phase one, responses to open-ended questions were added to MS EXCEL and were manually evaluated by two researchers for emerging themes. Emerging themes were grouped in categories and labeled consistent with the quotations included in each category. Demographic data were analyzed using SPSS 22.0. For phase two, descriptive statistics, t-tests, and ANOVA were conducted to determine differences between attitudes, behaviors, and knowledge pre- and post-intervention using SPSS 22.0.
REFERENCES


CHAPTER 4: FOOD SAFETY INSPECTORS’ VIEWS ON FOOD SAFETY NEEDS IN INDEPENDENTLY-OWNED CHINESE RESTAURANTS

A paper to be submitted to the Journal of Foodservice Management and Education

Dawei Li, & Lakshman Rajagopal

Abstract

The purpose of this study was to explore food safety inspectors’ views on food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants in a Midwestern state in the United States. Twenty-eight food safety inspectors completed a web-based questionnaire and identified language barriers and cultural differences as major challenges faced by inspectors when conducting food safety inspections. Critical and non-critical violations commonly observed were improper cooling of foods and unclean non-food contact surfaces, respectively. Providing food safety training and educational tools in Chinese language was considered critical to improve food safety in Chinese restaurants.

Keywords: food safety, food safety inspections, foodservice, Chinese restaurants

Acknowledgements

This study was funded by the Food Service Systems Management Education Council. The authors would also like to thank the Iowa Department of Inspections and Appeals for their assistance with this study and to Dr. Angela M. Shaw and Dr. Susan W. Arendt for providing expert advice.
Introduction

Every year, contaminated food results in a number of illnesses and deaths in the United States (U.S.). Annually, known disease-causing agents in food cause an estimated 9.4 million illnesses, 55,961 hospitalizations and 1,351 deaths (Scallan et al., 2011b), and unknown disease-causing agents cause an additional 38.4 million illnesses, 71,878 hospitalizations and 1,686 deaths (Scallan, Griffin, Angulo, Tauxe, & Hoekstra, 2011a).

In 2014, Americans spent approximately $683.4 million purchasing food away from home (National Restaurant Association [NRA], 2014). An alarming majority (59%) of reported foodborne illnesses have been linked to errors in food handling at foodservice operations (Centers for Disease Control and Prevention [CDC], 2013). It is estimated foodborne illnesses cost consumers $51-78 billion in annual health-related costs (Scharff, 2012). Foods consumed at retail foodservice establishments in commercial and non-commercial sectors have been implicated in outbreaks of foodborne disease. Around 48% of the foodborne disease outbreaks reported in 2009-2010 were associated with restaurants or delicatessens-including cafeterias and hotels (CDC, 2013). Contamination can occur at any point in the flow of food in foodservice establishments. Therefore, maintaining food safety is critical for the health and well-being of Americans.

The demographic landscape of the U.S. has rapidly changed because of an increase in immigration and globalization. While, Hispanics are the largest minority in the U.S., Asians have become the fastest growing demographic in the U.S. from 2000-2010, increasing by 43% from 2000. It is estimated that the Asian
population will grow from 14.1 million in 2010 to 34.4 million by 2050 (U.S. Census Bureau, 2010). This increase in diversity contributes to the increase in the number ethnic restaurants (Mintel, 2014). Americans are becoming increasingly interested in tasting foods from different cultures. The most popular ethnic cuisines in the U.S are Mexican, Italian, and Asian—primarily Chinese and Japanese (Lee, Hwang, & Mustapha, 2014). With the increasing number of ethnic restaurants; food handling practices in these establishments is a concern to food safety inspectors and consumers.

Foodborne disease outbreaks have been associated with ethnic restaurants serving Asian, Italian, and Mexican foods. Foodborne illness data associated 2,727 cases of outbreaks to Salmonella, Norovirus, Clostridium perfringens, Campylobacter jejuni, Bacillus cereus, and E. coli O157:H7 in Mexican restaurants and 113 cases to Bacillus cereus, Norovirus, Campylobacter jejuni, Staphylococcus aureus, and Campylobacter in Chinese restaurants. Norovirus, Staphylococcus aureus, Bacillus cereus, Clostridium perfringens, and Salmonella enterica were associated with 336 outbreaks in Italian restaurants and Salmonella enterica, Norovirus, Bacillus cereus, Campylobacter jejuni, and Staphylococcus aureus were associated with 298 outbreaks in Japanese restaurants (Lee, Hwang, & Mustapha, 2014).

The U.S. Food and Drug Administration (FDA, 2013a) identified five risk factors that contribute to foodborne illness: (1) purchasing food from unsafe sources, (2) inadequate cooking of foods, (3) improper holding temperatures, (4) contaminated equipment, and (5) poor personal hygiene. These five risk factors
along with other factors are reviewed during food safety inspections. Food safety inspections are critical to ensuring foodservice establishments are following food safety and sanitation guidelines outlined by the Food Code, adopted by the state (FDA, 2013a). The Food Code “assists food control jurisdictions at all levels of government by providing them with a scientifically sound technical and legal basis for regulating the retail and food service segment of the industry (restaurants and grocery stores and institutions such as nursing homes)” (FDA, 2013b). The Food Code is updated every four years, but the FDA publishes supplements in the interim with updates. Not all states follow the most recent Food Code, which could also explain the discrepancy in food handling practices in foodservice establishments and thus the incidences of foodborne illnesses.

Food safety inspections of retail foodservice establishments are conducted annually or sometimes more depending on the type of establishment and food safety history of the establishments, and availability of food safety inspectors. Increasing frequency of inspections and requiring food safety certification has been found to decrease rates of foodborne illness, and restaurants with established food safety procedures in place were able to do a better job of maintaining food safety than those restaurants that did not. (Zablotsky Kufel, Resnick, Fox, McGready, Yager, Burke, 2011). Newbold, McKeary, Hart, and Hall (2008) found no relationship between food safety compliance and increased inspection frequency but suggested food safety inspections are an opportunity to educate food safety workers about food safety.
A review of restaurant inspections found ethnic restaurants had more critical and non-critical violations, and more frequent food safety inspections than non-ethnic restaurants (Kwon, Roberts, Shanklin, Liu, & Yen, 2010). Significantly more violations were observed in ethnic restaurants for improper time and temperature control, improper maintenance of facility, inadequate prevention of contamination, poor hand hygiene, improper use of utensils, insufficient demonstration of food safety knowledge, and improper temperature control of food not considered potentially hazardous. A review of critical violations of all restaurants from 2008-2010 in Jefferson County, Alabama found characteristics of restaurants such as type of cuisine were associated with frequency of certain critical violations (Menachemi, Yeager, Taylor, McClure, & Outmeter, 2012). The most common critical violations in Asian and Mexican restaurants were documenting procurement of food from approved/safe sources and Asian restaurants had a higher frequency of critical violations associated with cross contamination than Mexican restaurants. Evaluation of food samples from these restaurants found that 35.7% of samples had detectable levels of \textit{Staphylococcus aureus} in both types of restaurants and 42.2% of food samples were received outside the temperature danger zone; suggesting a need for food safety education.

Among ethnic cuisines, Chinese cuisine has been identified as the most preferred ethnic cuisine in the U.S. followed by Mexican, Japanese, and Thai cuisine (Lee, Niode, Simonne, & Bruhn, 2012). There are more than 46,000 Chinese restaurants in the U.S., which is, perhaps twice the number of
McDonald’s restaurants (Chinese Restaurant News, 2008). The annual sales of Chinese restaurants reached over $20 billion in 2008, accounting for 5.0% of total food and drinks sales in the U.S. Due the growth and expansion of the U.S. restaurant industry, Chinese restaurants have been facing competition from other types of restaurants, including other Asian restaurants - Indian, Japanese, Korean, Thai, and Vietnamese (Liu & Jang, 2008). However, Chinese cuisine still dominates the Asian restaurant market in the U.S. With the increasing popularity of Chinese food among consumers, maintaining safety of the food served at Chinese restaurants is critical for preventing incidences of foodborne illness. In an examination of Chinese and Mexican restaurants in San Francisco by Satow, Inciardi, and Walllance (2009) found sanitation levels in Chinese and Mexican restaurants to be poor.

Simonne, Nille, Evans, & Marshall (2004) suggested the increased incidence of foodborne illness originating from ethnic restaurants could be a result of unfamiliarity with ethnic ingredients, lack of knowledge about ethnic foods, and cultural barriers such as communication problems, low risk perception, or belief in handling food in foodservice establishments similar to the way it is handled at home. Cultural differences in food handling by the Chinese and Americans can also influence views on food safety practices in Chinese restaurants. Also, examining the role of Chinese culture and beliefs might help food safety inspectors conduct food safety inspections and communicate observed food safety risks to managers and workers in a culturally sensitive and effective manner. A study of Chinese restaurateurs found courtesy, respect, and harmony as
the top three Chinese cultural values (Liu, Kwon, Shanklin, Canter, & Webb, 2014). Food safety inspectors play a critical role as a resource for food safety information in addition to performing routine health inspections, conducting food safety training programs and investigating suspected reports of foodborne illness (Pham, Jones, Sargeant, Marshall, & Dewey, 2010).

Providing training and appropriate support (internal and external to the establishment) is important, assessing the experiences of food safety inspectors when conducting food safety inspections in Chinese restaurants is important for the development of appropriate approaches to educating Chinese-speaking foodservice workers about food safety. The purpose of this study was to explore food safety inspectors’ views on the food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants in a Midwestern state in the United States.

Methods

Sample

Food safety inspectors employed with the Department of Inspections and Appeals (DIA) in a Midwestern state and with experience conducting food safety inspections in independently-owned Chinese restaurants participated in this study. The DIA has a joint state and local inspection program for restaurants and other establishments where food is served, such as schools, nursing homes, and hospitals.
Data collection

A web-based questionnaire consisting of 13 open-ended questions was developed (Appendix E) and administered to food safety inspectors employed with the Department Inspection and Appeals (DIA) \((n=45)\) in a Midwestern U.S. state. The questionnaire was posted online using the survey management software - Qualtrics\textsuperscript{©}. The questionnaire consisted of 13 open-ended questions. The questionnaire was designed to elicit detailed information about participants’ experiences with conducting food safety inspections, their observations of food safety practices, cultural barriers, and challenges faced when conducting food safety inspections in independently owned Chinese restaurants. The questionnaire was reviewed by experts \((n=3)\) in food safety and foodservice operations for content validity and pilot-tested with food safety inspectors \((n=2)\) for clarity and content. Food safety inspectors that participated in the pilot study were excluded from the main study. Feedback obtained from the pilot study was used to improve the questionnaire for clarity prior to distribution. An invitation email containing the link to the questionnaire was sent to all participants listed in the mailing list provided by the DIA. Participants provided informed consent prior to participating in this study. Following recommendations by Dillman (2014), reminder emails were sent at weeks 1, 2, and 3.

Data Analyses

Descriptive statistics was computed for the demographic questions using Statistical Package for Social Sciences (SPSS) version 22.0. Responses to open-ended questions were entered into MS EXCEL and manually evaluated by two
researchers for themes. Themes were grouped into categories and labeled consistent with the quotations included in each category.

Results and Discussion

Profile of Respondents

Of the 45 food safety inspectors invited to participate in this study, 28 completed the questionnaire (62.2%). Participants from all regions of the state were represented in this study. Almost equal number of males (n=15, 53.6%) and females (n=13, 46.4%) participated in this study. The majority of participants were between the ages of 31-60 years (n=25, 85.7%) and had obtained a Bachelor’s degree (60.7%). Participants had an average of 9.9±4.5 years of experience conducting food safety inspections in restaurants and a similar number of years of experience (9.9±5.0) conducting food safety inspections in independently-owned Chinese restaurants. The number of independently-owned Chinese restaurants inspected annually ranged from 2-31 restaurants with an average of 9.6±7.1 (Table 4.1). An increase in the number of Chinese restaurants in the United States (Chinese Restaurant News, 2008) is reflected in the high number of restaurants inspected by food safety inspectors.

Food Safety in Independently-owned Chinese Restaurants

Table 4.2 presents findings of the experiences of food safety inspectors when conducting food safety inspections in independently-owned Chinese restaurants. Participants identified food safety practices commonly found in compliance with the Food Code were: cooking temperatures, holding temperature, date marking, monitoring employee health, purchasing from approved sources, and dishwashing. Participants also identified the following food safety concerns:
incorrect cooling methods of foods, improper holding temperatures of raw and cooked food (particularly buffets), poor general cleanliness, lack of pest control, incorrect dishwashing procedures, and lack of date marking of foods. Dishwashing and date marking were identified as being in compliance and also as concerns.

However, cold holding temperatures were noted as a concern particularly when holding cold foods on buffets. In a study of cooling practices in 420 restaurants serving American, Italian, Mexican, or other cuisines (Brown et al. (2012), most restaurant managers (86%) reported having formal protocols for cooling of foods and providing training to their employees about proper cooling (91%); 39% of managers did not have cooling procedures that were tested for effectiveness, 41% did not monitor time and temperature during cooling, and 15% did not calibrate thermometers used for monitoring cooling temperatures. Non-adherence to proper cooling methods is a concern because if managers do not monitor use of proper cooling procedures, it is likely the employees are not practicing safe food handling practices either. While, few food safety inspectors found certain practices in compliance with the Food Code such as date marking (n=3), dishwashing procedures (n=2); a higher number of participants listed the same practices as concerns suggesting these practices were not commonly observed. The procedures that are of concern to food safety inspectors also correspond to the top five risk factors contributing to foodborne illness (FDA, 2006).
Critical violations that food safety inspectors had difficulty in getting Chinese restaurant managers to correct were: cooling foods, date marking, preventing cross contamination, holding foods at correct temperatures, adequate pest control, sanitizing food contact surfaces, general safe food handling practices (wearing gloves, avoiding bare hand contact, washing hands frequently when handling different foods), monitoring of employee health, proper storage of raw meat, use of manual three-compartment sink. Non-critical violations food safety inspectors had difficulty in getting Chinese restaurant managers to correct were: inadequate or not cleaning of non-food contact surfaces, proper utensil storage, labeling of foods, use of test papers to check sanitizer concentration, covering food in storage, thermometers usage.

Food safety and sanitation issues that could be improved upon were: general cleanliness of facility, food safety knowledge of staff, holding food at correct temperatures, preventing cross contamination, adequate sanitizing, and others issues (Table 4.3). Kwon et al. (2010) found Asian, Mexican, or Latin American restaurants to have more food code violations associated with time and temperature abuse than non-ethnic restaurants. Other researchers have also reported time temperature abuse of foods in restaurants (Walczak, 2000; FDA, 2006). Kwon, Roberts, Shanklin, Liu, and Yen (2010), and Menachemi, Yeager, Taylor, Mcclure, and Outmet (2012) also found ethnic restaurants to have similar food safety and sanitation issues.
Cultural Issues and Barriers

In response to questions regarding cultural issues food safety inspectors faced when conducting food safety inspections in independently-owned Chinese restaurants; language barriers (n=14) and cultural differences (n=14) were identified as challenges and also barriers by 50% of the participants followed by communication problems; lack of knowledge of the Food Code; time and financial constraints for food safety inspectors to train and educate foodservice workers. Chinese-speaking foodservice workers tended to be conservative in their views on handling their business and did not like to be told what to do.

Workers followed traditional food handling practices native to their culture, had low risk perception, were frugal (reused storage containers for food storage such as cardboard boxes, plastic containers that previously contained non-food items), hid themselves or their poor food handling practices from the food safety inspector; showed no respect to food safety inspectors, and because most of the restaurants were family-owned restaurants they lacked restaurant management skills which can impact food handling behaviors.

Research on Chinese cultural values and beliefs found trust, reciprocity, face, time, harmony, hierarchy, professional distance, and long-term orientation to influence Chinese business practices (Fan, 2000; Matthews, 2000; Rokeach, 1973; Kuo-Shu, 1987). Mock and DeFranco (1999) found the Chinese prefer resolution of issues in a “implicit and mild” manner which could explain why food safety inspectors perceived Chinese restaurant workers were hiding themselves or their food handling practices from them and this could also be to save “face/reputation”
(Linsk & Sitaramaiah, 2000). Respect and saving face were identified as important by Chinese restaurant owners to encourage cooperation and compliance with food safety inspector recommendations (Liu & Kwon, 2013). Rudder (2006) also found language barriers, lack of knowledge and understanding of food safety concepts to be major challenges to practicing food safety in ethnic food retail businesses. Food safety inspectors (n=17) believed cultural differences could also be addressed by providing food safety training and training materials in Chinese.

**Ways to Improve Food Safety in Independently-owned Chinese Restaurants**

To improve food safety attitudes, knowledge and practices of Chinese-speaking foodservice workers, food safety inspectors suggested providing training and training materials in Chinese language, foodservice workers complete a food safety course and/or obtain food safety certification, use videos/posts/demonstrations/picture cards with food safety information in Chinese, provide a Chinese training handbook which can serve as a one-stop source for food safety information, and use of other resources such as the FDA Oral Culture Learner Project training materials (FDA, 2015). These underscore the importance of using training tools in the native language and that are visual-based.

Rajagopal (2012, 2013) found visual-based food safety training helpful in improving food safety knowledge scores of Spanish-speaking foodservice workers. Also, participants suggested explaining the importance of food safety with science-based information so it makes “sense”, and this will help food safety inspectors from being perceived as “trouble makers”. Similar approaches were suggested for addressing cultural differences. While cultural differences are
difficult to address and given the limited resources and time available to food safety inspectors; providing training and tools in Chinese language were considered to be main ways of addressing cultural issues and improve food safety practices of Chinese-speaking foodservice workers in Chinese restaurants.

Conclusions and Future Research

This study explored food safety inspectors’ views of food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants using a web-based questionnaire. This study identified many challenges food safety inspectors faced when conducting food safety inspections in independently-owned Chinese restaurants of which language and cultural barriers were identified as major challenges. Language barriers impacted communication with Chinese foodservice workers leading to difficulty in conveying food safety messages on-site, explaining the rationale for food safety practices that needed corrections, and conducting training. It was interesting to note that language barriers were identified as a challenge and also as a cultural difference.

Due to limited research related to food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants, this study fills the research gap by presenting the views of food safety inspectors. Results could aid food safety educators when developing educational tools by tailoring training to issues identified by food safety inspectors. However, the onus of ensuring food safety does not lie only with food safety inspectors. Foodservice managers and
foodservice workers must work together with food safety inspectors to improve food safety in their restaurants.

It is important that in addition to food safety training and conducting food safety inspections, food safety inspectors should also examine the role of culture on food handling practices. This can be achieved by providing food safety inspectors some training on cultural sensitivity, introducing a brief overview of dominant cultures in the U.S., and identify strategies to interact successfully with ethnic foodservice workers. For example, food safety inspectors can earn trust by interacting with Chinese-foodservice workers informally for 5-10 minutes before beginning the inspection or learning some Chinese words (such as hello, how are you) to “break the ice”.

Findings could also help food safety researchers and Extension educators develop food safety training and educational materials that consider the role of a Chinese culture. Educators can also consider the role of food safety culture (Arendt & Sneed, 2008; Griffith et al., 2010; Powell et al., 2011; Ungku Fatimah et al., 2013; Yiannas, 2008) of Chinese restaurants as a person’s culture may influence their food safety behaviors. Foodservice educators can utilize the findings of this study to teach foodservice management students about culture and its influence on food safety.

This study was conducted in one state and results from this study cannot be generalized to other parts of the U.S. or other types of ethnic restaurants, as each culture is unique. While, the sample size in this study was small; the information obtained in this study provided an account of the needs of Chinese-
speaking foodservice workers in independently-owned Chinese restaurants from a different viewpoint as opposed to self-reported food safety behaviors which have been found to not accurately represent actual behaviors (FDA, 2009; Strohbehn, Paez, Sneed, & Meyer, 2008).

Future research could explore the development and assessment of Chinese language food safety training with Chinese-speaking foodservice workers. Most food safety inspectors mentioned the importance of training in Chinese language and also use visual-based training; future research could explore the effectiveness of visual-based training on attitudes, knowledge, and practices of Chinese-speaking foodservice workers. Observations of food handling practices of Chinese-speaking foodservice workers in Chinese restaurants can also be carried out to get a first-hand account of actual food handling practices before and after training. However, this study is the first known study that provided an opportunity to view food safety inspectors’ food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants.
Table 4.1. Demographic profile of food safety inspectors (n=28)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>13</td>
<td>46.4</td>
</tr>
<tr>
<td>Male</td>
<td>15</td>
<td>53.6</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-30 years</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>31-40 years</td>
<td>9</td>
<td>32.1</td>
</tr>
<tr>
<td>41-50 years</td>
<td>8</td>
<td>28.6</td>
</tr>
<tr>
<td>51-60 years</td>
<td>7</td>
<td>25.0</td>
</tr>
<tr>
<td>More than 60 years</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td><strong>Educational level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associates</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td>Bachelors</td>
<td>17</td>
<td>60.7</td>
</tr>
<tr>
<td>Masters</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Doctoral</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td><strong>Experience with food safety inspections</strong></td>
<td>M±SD</td>
<td></td>
</tr>
<tr>
<td>Experience with conducting food safety inspections in restaurants (years)</td>
<td>9.93±4.5</td>
<td></td>
</tr>
<tr>
<td>Experience with conducting food safety inspections in independently-owned Chinese restaurants (years)</td>
<td>9.86±5.0</td>
<td></td>
</tr>
<tr>
<td>Average number of independently-owned Chinese restaurants inspected every year</td>
<td>9.61±7.1</td>
<td></td>
</tr>
</tbody>
</table>
Table 4.2. Food safety practices in compliance, concerns, and critical violations and non-critical violations food safety inspectors have difficulty correcting in independently-owned Chinese restaurants (n=28)

<table>
<thead>
<tr>
<th>Items/Themes</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food safety practices in compliance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking foods to appropriate internal</td>
<td>14</td>
<td>50.0</td>
</tr>
<tr>
<td>temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proper holding temperature</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td>Date marking of foods</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Awareness of the importance of employee</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchasing foods from approved source</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>Proper dish washing procedures</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Food safety concerns</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improper cooling of foods</td>
<td>10</td>
<td>35.7</td>
</tr>
<tr>
<td>Improper cold holding temperature</td>
<td>9</td>
<td>32.1</td>
</tr>
<tr>
<td>Lack of proper pest management,</td>
<td>6</td>
<td>21.4</td>
</tr>
<tr>
<td>Improper dishwashing procedures</td>
<td>6</td>
<td>21.4</td>
</tr>
<tr>
<td>Date marking</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td><strong>Critical violations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improper cooling of foods</td>
<td>9</td>
<td>32.1</td>
</tr>
<tr>
<td>Inadequate date marking of foods</td>
<td>9</td>
<td>32.1</td>
</tr>
<tr>
<td>Cross contamination</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td>Improper holding temperature</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td>Improper sanitizing</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td>Poor pest control</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td>Unclean food contact surfaces</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>General unsafe food handling practices</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>Poor employee health</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>Improper storage of raw meat</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>Improper or lack of use of three-compartment sink for sanitizing</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td><strong>Non-critical violations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unclean non-food contact surfaces</td>
<td>16</td>
<td>57.1</td>
</tr>
<tr>
<td>Improper utensil storage</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>Inadequate or lack of labeling of foods</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>Lack of use of test papers to check</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>sanitizer concentrations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaving food uncovered during storage</td>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>Lack of food thermometer use</td>
<td>1</td>
<td>3.6</td>
</tr>
</tbody>
</table>
Table 4.3. Food safety and sanitation practices that need improvement (n=28)

<table>
<thead>
<tr>
<th>Themes</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>General cleanliness of facility</td>
<td>11</td>
<td>39.3</td>
</tr>
<tr>
<td>Food safety knowledge of foodservice staff</td>
<td>9</td>
<td>32.1</td>
</tr>
<tr>
<td>Proper holding temperature of foods</td>
<td>7</td>
<td>25.0</td>
</tr>
<tr>
<td>Preventing cross-contamination</td>
<td>6</td>
<td>21.4</td>
</tr>
<tr>
<td>Sanitizing procedures</td>
<td>6</td>
<td>21.4</td>
</tr>
<tr>
<td>Store food correctly</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td>Frequent and proper handwashing</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td>Date marking of foods</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td>Avoiding bare hand contact with foods</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td>Proper cooling procedures</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Proper ware washing procedures</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Adequate pest control procedures</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Reduce language barriers for effective communication</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td>Follow proper food handling practices</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>Learn better communication with food inspectors</td>
<td>2</td>
<td>7.1</td>
</tr>
</tbody>
</table>
### Table 4.4. Cultural issues that food safety inspectors face when conducting food safety inspections (n=28)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Themes</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural Issues</td>
<td>Language barriers</td>
<td>14</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>Conservativeness of Chinese culture</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td></td>
<td>Low risk perception</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>Frugality</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>Hiding the truth about actual food handling practices or themselves from food safety inspectors</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>Lack of respect for food safety inspectors</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td>Challenges or barriers</td>
<td>Language barriers</td>
<td>14</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>Cultural differences</td>
<td>14</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>Communication problems</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td></td>
<td>Lack of knowledge of the Food Code</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>Time constraints during inspections to explain food safety issues, financial constraints</td>
<td>1</td>
<td>3.6</td>
</tr>
</tbody>
</table>
Table 4.5. Food safety attitudes, knowledge, practices, training tools that will be helpful in addressing issues when working with Chinese-speaking foodservice workers in independently-owned Chinese restaurants (n=11-28)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Themes</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food safety attitudes (n=17)</td>
<td>Explain the why and importance of food safety</td>
<td>7</td>
<td>41.2</td>
</tr>
<tr>
<td></td>
<td>Provide food safety class in Chinese</td>
<td>4</td>
<td>23.5</td>
</tr>
<tr>
<td></td>
<td>Provide food safety class in Chinese</td>
<td>10</td>
<td>58.8</td>
</tr>
<tr>
<td>Food safety knowledge (n=17)</td>
<td>Provide food safety class in Chinese</td>
<td>10</td>
<td>58.8</td>
</tr>
<tr>
<td></td>
<td>Use multiple teaching tools such as videos, posters, and handouts for training</td>
<td>7</td>
<td>41.2</td>
</tr>
<tr>
<td>Food safety practices (n=17)</td>
<td>Provide food safety class in Chinese</td>
<td>9</td>
<td>52.9</td>
</tr>
<tr>
<td></td>
<td>Take an interpreter with science background to accompany the inspector on some of the inspections</td>
<td>4</td>
<td>23.5</td>
</tr>
<tr>
<td></td>
<td>Provide training materials in Chinese</td>
<td>4</td>
<td>23.5</td>
</tr>
<tr>
<td>Ways in which cultural issues could be addressed (n=17)</td>
<td>Provide food safety class in Chinese</td>
<td>9</td>
<td>52.9</td>
</tr>
<tr>
<td></td>
<td>Take an interpreter with science background to accompany the inspector on some of the inspections</td>
<td>4</td>
<td>23.5</td>
</tr>
<tr>
<td></td>
<td>Provide training materials in Chinese</td>
<td>4</td>
<td>23.5</td>
</tr>
<tr>
<td>Types of food safety training tools that would be helpful (n=28)</td>
<td>Provide training and training materials in Chinese</td>
<td>10</td>
<td>35.7</td>
</tr>
<tr>
<td></td>
<td>Provide food safety certification (e.g. ServSafe)</td>
<td>8</td>
<td>28.6</td>
</tr>
<tr>
<td></td>
<td>Videos</td>
<td>8</td>
<td>28.6</td>
</tr>
<tr>
<td></td>
<td>Posters</td>
<td>7</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>Demonstrations</td>
<td>3</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>Picture cards with information in their language; Chinese to English translation packets training</td>
<td>1</td>
<td>3.6</td>
</tr>
</tbody>
</table>
**Figure 4.6.** Overview of feedback provided by food safety inspectors (n=28)

<table>
<thead>
<tr>
<th>Food Safety Practices in Compliance and Concerns</th>
<th>In Compliance</th>
<th>Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooking temperatures of foods</td>
<td></td>
<td>Improper cooling of foods</td>
</tr>
<tr>
<td>Holding temperatures of foods</td>
<td></td>
<td>Improper cold holding temperature</td>
</tr>
<tr>
<td>Date marking of foods</td>
<td></td>
<td>Lack of proper pest management</td>
</tr>
<tr>
<td>Awareness of the importance of employee health</td>
<td></td>
<td>Improper dishwashing procedures</td>
</tr>
<tr>
<td>Purchasing foods from approved sources</td>
<td></td>
<td>Lack of date marking of foods</td>
</tr>
<tr>
<td>Dishwashing procedures</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Challenges and Barriers Food Safety Inspectors Faced</th>
<th>Language barriers</th>
<th>Cultural differences</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Suggestions for Improving Food Safety and Address Cultural Issues</th>
<th>Provide training and training materials in their native language</th>
<th>Provide food safety course in Chinese</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use videos and posters in Chinese language</td>
<td></td>
</tr>
</tbody>
</table>

References


doi:10.2105/AJPH.2011.300137
CHAPTER 5: ADDITIONAL RESULTS AND DISCUSSION

This chapter presents results and discussion from the findings of phase two. The purpose of this phase was to develop and test the effectiveness of visual-based, minimal-text food safety training materials on food safety knowledge and attitudes of Chinese-speaking foodservice workers in independently-owned Chinese restaurants. This phase aimed to investigate the following research objectives:

1) Assess food safety attitudes, knowledge, practices, and training received of Chinese-speaking foodservice workers in independently-owned Chinese restaurants.

2) Develop and evaluate the effectiveness of visual-based, minimal-text training materials on food safety attitudes, knowledge, and practices of Chinese-speaking foodservice workers in independently-owned Chinese restaurants.

Results and Discussion

Demographic profile of participants

Out of 60 participants that were recruited to participate in this study, 56 (93.3%) agreed to participate and completed the study (Table 5.1). More females (n=33/58.9%) than males (n=23/41.1%) participated in the study and most participants were older than 38 years old (n=37/66%). Participants had completed middle school or higher (78.6%) Most participants had more than 2-5 years of experience in the foodservice industry (n=50/89.3%) and had worked at their current restaurant for less than a year to more than ten years. Almost all participants had not received any formal food safety training (n=52/92.9 %) which is not surprising as the Food Code only requires one person on staff (typically the
manager) to possess food safety certification (Food and Drug Administration [FDA], 2013) (Table 5.2). While participants did not receive any formal training, they may have received some informal food safety training on the job, but that was not explored in this study.

Obtaining food safety certification has been found to be associated with higher food safety knowledge scores among foodservice managers and workers (DeBess et al., 2009; Lynch et al., 2003; Manes et al., 2013). It was not surprising most participants did not have any food safety certification because they were foodservice workers and were not required to have food safety certification. When participants were asked if they had received any training in their workplace on topics ranging from personal hygiene to safe use of chemicals, it was interesting to note most participants had not received training on many topics that would be critical for maintaining food safety.

Questionnaires administered before and after training assessed the impact of the visual-based, minimal-text training along with hands-on activities on food safety attitudes and knowledge. Training improved total food safety knowledge scores by 52.1% from 12.9±2.7 (pre-training) to 29.0±1.0 (post-training) (Table 5.3). Each correct answer was worth one point for a total possible food safety knowledge score of 30. An increase in knowledge was observed post-training for all 13 categories of the knowledge portion of the questionnaire. The percent change in knowledge scores ranged from 21.4% (reheating) to 73.2% (preparation). While knowledge scores improved overall; participants were still unsure about answers to certain topics such as reheating, general food safety
knowledge, and service after completion of training. Paired-samples t-test conducted to compare pre and post-training food safety knowledge scores showed a statistically significant difference for total food safety knowledge scores (M=28.5±1.0) and total scores of pre-training food safety knowledge (M=12.9±2.7); t(55)=14.55, p = 0.000. The range of difference between total scores of post and pre-training food safety knowledge was [14.9, 16.4]. Other researchers also found an increase in food safety knowledge scores after food safety training (Costello, Gaddis, Tamplin, & Morris, 1997; Lynch, Elledge, Griffith, & Boatright, 2005; Rajagopal, 2012, 2013; Roberts et al., 2008).

However, increase in food safety knowledge has not always been found to correlate with actual food safety practices (Roberts et al., 2008).

Significant differences in attitude scores were observed between pre-training (M=3.5±0.6) and post-training (M=4.1±0.4), t(55)=6.62, p = 0.000. The range of 95% confidence interval of the difference between average total attitude scores of post and pre-training was [0.4, 0.8]. Attitude scores ranged from 4.5±0.60 to 4.7±0.5. Total attitude scores improved by 17.1% after training suggesting the training was helpful in changing some attitudes towards food safety. However, the increase though statistically significant, was not a large increase as was observed for a total knowledge score. This could be attributed to the fact changing attitudes takes time as they are rooted in a person’s cultural background and beliefs.

While providing food safety training could help promote safe food handling practices, Roberts et al. (2008) and York, Brannon, Shanklin, Roberts,
Howells, & Barrett (2009) found training to not influence food handling behaviors such as attitudes, subjective norms, and perceived behavior control. One-way analysis of variance (ANOVA) yielded significant differences in knowledge scores post-training between foodservice workers who had received food safety training before participating in this study (M=19.6, SD=1.2) and those who had never received any food safety training (M=15.2, SD=0.5), $F(0.008)=12.24$, $p<.001$, suggesting those who had received food safety training in the past were more likely to have better knowledge of food safety than those who had never received any food safety training.

Participants’ self-reported food safety behaviors suggested safe food handling practices were being practiced with 50% or higher number of participants reporting a high level of compliance. Self-reported food safety practices have been found not to correlate with actual practices possibly due to social desirability bias or due to the need to “save face and gain respect” (Liu & Kwon, 2013). In individual interviews conducted with Chinese restaurant managers/owners by Liu and Kwon (2013) “respect” and “saving face” were frequently mentioned as the Chinese believe in saving face to avoid disgracing themselves and or their family and want to feel “respected”. Almost 89% of participants agreed they use a three-compartment sink for washing pots and pans, and store raw food in an area separate from cooked food.

Po, Bourguin, Occeeia, and Po (2011) suggested appropriate translation and visuals would be helpful to overcome language barriers and relay critical food safety messages in a short and easy to understand manner. Visual-based training
along with hands-on activities were effective in training Spanish-speaking foodservice workers about safe food handling practices resulting in improved food safety knowledge scores (Rajagopal, 2012, 2013). Visual-based training (videos, pictures) can also help Chinese-speaking foodservice workers better understand food safety messages. Liu and Kwon (2013) found that Chinese foodservice managers preferred to receive food safety training through videos and materials translated in Chinese.

Conclusions and Applications

Findings from this study were helpful in providing insights into the food safety needs of Chinese-speaking foodservice workers in independently-owned restaurants. In phase one, food safety inspectors identified food safety issues, challenges, and cultural barriers and provided ways in which food safety attitudes, knowledge, and practices could be improved in these restaurants. Common concerns were related to poor personal hygiene, time-temperature abuse, cross contamination, improper cleaning and sanitizing of food and non-food contact surfaces and equipment which are among the top five risk factors identified by the FDA (2013) as causative agents of foodborne illness. Language barriers and cultural barriers were frequently encountered by food safety inspectors when conducting inspections in independently-owned Chinese restaurants. Providing training and educational tools in the Chinese language was thought to be helpful in addressing these challenges.

While, visual-based training was found to be useful in improving food safety knowledge and attitudes; since the assessment was carried out immediately
after training; participants might have retained knowledge. The long-term effect of training should be examined through assessment of knowledge gained through observational assessment of food handling practices. Similar research can be carried out with Chinese-speaking foodservice workers in other foodservice settings to determine differences in training effectiveness. While, many resources for training foodservice workers on food safety are available, most of those resources contain a lot of text that may be difficult for some Chinese foodservice to read and understand its food safety messages. The researcher in this study was a native Chinese speaker who read the questions and response options aloud after distributing the questionnaire because not all participants were able to read Chinese or had limited knowledge of written Chinese. Similar future studies should informally assess the reading level of participants prior to administering a questionnaire. Since this study was carried out in Central Iowa, the results cannot be generalized to Chinese-speaking foodservice workers in other parts of the U.S.

Future research could examine the effectiveness of visual-based materials to train Chinese-speaking foodservice workers about topics such as food allergies, food defense, workplace safety, and other issues relevant to food safety and also physical safety. These training tools can also be used for informal training of foodservice workers, as formal training can be expensive and hard to incorporate in the busy foodservice environment. Posting of training materials in strategic places in the foodservice establishment can serve as an informal reminder of safe food handling practices that can help improve food-handling practices. Training materials developed in this study provided critical food safety messages in a
succinct manner with visuals and were successful in improving food safety attitudes and knowledge of Chinese-speaking workers employed in independently owned Chinese restaurants. As the diversity of the U.S. workforce continues to increase; food safety educators and researchers will need to develop and utilize more visual based training tools, and assess its effectiveness to improve food handling practices and reduce the incidence of foodborne illness.

Conducting research studies with ethnic restaurants can be challenging because ethnic restaurants may not be willing to participate (Roberts & Barrett, 2009; Roberts et al., 2008). This study found making phone calls to request participation was an ineffective way of recruitment as Chinese restaurant managers preferred to see the “face” of the person recruiting participants, as the Chinese culture relies on respect and trust. Chinese restaurant managers were more willing to assist with recruiting participants if they met the researcher in person.

When recruiting from Chinese participants, the researcher encountered managers who were unwilling to allow their workers to participate in this study, which could be because they found the training to be an invasion of their restaurant’s privacy, fear of being reported to the health authorities or lack of trust in their foodservice workers who might reveal the “reality” of their workplace. Some managers immediately ceased talking to the researcher when the word “food safety” was mentioned. It is advisable for future researchers to address trust issues by building a relationship with the managers over the course of time and clearly explaining the research purpose, possibly in layman terms.
Table 5.1 Demographic profile of Chinese-speaking foodservice workers (n=56)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>33</td>
<td>(58.9%)</td>
</tr>
<tr>
<td>Male</td>
<td>23</td>
<td>(41.1%)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-27 years or younger</td>
<td>12</td>
<td>(21.4%)</td>
</tr>
<tr>
<td>28-37 years</td>
<td>4</td>
<td>(7.1%)</td>
</tr>
<tr>
<td>38-47 years</td>
<td>22</td>
<td>(39.3%)</td>
</tr>
<tr>
<td>48-57 years</td>
<td>11</td>
<td>(19.6%)</td>
</tr>
<tr>
<td>58 or older</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Educational level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>2</td>
<td>(3.6%)</td>
</tr>
<tr>
<td>Middle School</td>
<td>13</td>
<td>(23.2%)</td>
</tr>
<tr>
<td>High School</td>
<td>17</td>
<td>(30.4%)</td>
</tr>
<tr>
<td>Some College</td>
<td>12</td>
<td>(21.4%)</td>
</tr>
<tr>
<td>Bachelor’s degree or higher</td>
<td>2</td>
<td>(3.6%)</td>
</tr>
<tr>
<td><strong>Number of years employed in the foodservice industry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year or less</td>
<td>6</td>
<td>(10.7%)</td>
</tr>
<tr>
<td>2-5 years</td>
<td>21</td>
<td>(37.5%)</td>
</tr>
<tr>
<td>6-9 years</td>
<td>21</td>
<td>(37.5%)</td>
</tr>
<tr>
<td>10-13 years</td>
<td>8</td>
<td>(14.3%)</td>
</tr>
<tr>
<td><strong>Number of years employed in this current restaurant</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year or less</td>
<td>18</td>
<td>(32.1%)</td>
</tr>
<tr>
<td>2-5 years</td>
<td>22</td>
<td>(39.3%)</td>
</tr>
<tr>
<td>6-9 years</td>
<td>12</td>
<td>(21.4%)</td>
</tr>
<tr>
<td>10-13 years</td>
<td>4</td>
<td>(7.1%)</td>
</tr>
<tr>
<td><strong>Number of times formal food safety training was provided in your workplace</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>52</td>
<td>(92.9%)</td>
</tr>
<tr>
<td>2 times</td>
<td>2</td>
<td>(3.6%)</td>
</tr>
<tr>
<td>3 times</td>
<td>2</td>
<td>(3.6%)</td>
</tr>
<tr>
<td><strong>Possess food safety certification</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>(7.1%)</td>
</tr>
<tr>
<td>No</td>
<td>52</td>
<td>(92.9%)</td>
</tr>
</tbody>
</table>
Table 5.2 Food safety topics in which training was obtained in the workplace (n=56)

<table>
<thead>
<tr>
<th>Food Safety Topic</th>
<th>Training received</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes n(%)</td>
<td>No n(%)</td>
</tr>
<tr>
<td>Components of good personal hygiene:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Hygienic hand practices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Proper handwashing</td>
<td>41(73.2%)</td>
<td>15(26.8%)</td>
</tr>
<tr>
<td>b) Hand maintenance (e.g. fingernails, nail polish)</td>
<td>11(19.6%)</td>
<td>45(80.4%)</td>
</tr>
<tr>
<td>b. Use of gloves</td>
<td>9(16.1%)</td>
<td>47(83.9%)</td>
</tr>
<tr>
<td>c. General personal cleanliness (e.g. clothing)</td>
<td>11(19.6%)</td>
<td>45(80.4%)</td>
</tr>
<tr>
<td>d. Proper work attire (e.g. hair restraint, uniform)</td>
<td>10(17.9%)</td>
<td>46(82.1%)</td>
</tr>
<tr>
<td>e. Reporting illness and injury</td>
<td>9(16.1%)</td>
<td>47(83.9%)</td>
</tr>
<tr>
<td>f. Policies regarding eating and drinking in work area</td>
<td>10(17.9%)</td>
<td>46(82.1%)</td>
</tr>
<tr>
<td>The relationship between personal hygiene and the spread of disease</td>
<td>20(35.7%)</td>
<td>36(64.3%)</td>
</tr>
<tr>
<td>Procedures for cleaning sanitizing utensils equipment and food contact surfaces</td>
<td>9(16.1%)</td>
<td>47(83.9%)</td>
</tr>
<tr>
<td>Procedures for cleaning and sanitizing glassware, silverware, and dishes.</td>
<td>9(16.1%)</td>
<td>47(83.9%)</td>
</tr>
<tr>
<td>Preventing cross contamination</td>
<td>23(41.1%)</td>
<td>33(58.9%)</td>
</tr>
<tr>
<td>Protecting food during service</td>
<td>11(19.6%)</td>
<td>45(80.4%)</td>
</tr>
<tr>
<td>a. Holding food for service</td>
<td>8(14.3%)</td>
<td>48(85.7%)</td>
</tr>
<tr>
<td>b. Safe serving procedures</td>
<td>10(17.9%)</td>
<td>46(82.1%)</td>
</tr>
<tr>
<td>Temperature danger zone the relationship with growth of microorganisms</td>
<td>8(14.3%)</td>
<td>48(85.7%)</td>
</tr>
<tr>
<td>Use of thermometer and taking temperature of food</td>
<td>7(12.5%)</td>
<td>49(87.5%)</td>
</tr>
<tr>
<td>Type of chemical used in the dining center and how to safely store use</td>
<td>8(14.3%)</td>
<td>48(85.7%)</td>
</tr>
</tbody>
</table>
### Table 5.3 Food safety attitude scores of Chinese-speaking foodservice workers (n=56)

<table>
<thead>
<tr>
<th>Items</th>
<th>M(SD) Pre-training</th>
<th>Post-training</th>
<th>Post-pre (95% CI)</th>
<th>Percent Change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think sanitation is an important part of my job responsibilities.</td>
<td>3.8(0.9)</td>
<td>4.7(0.5)</td>
<td>[0.7,1.2]</td>
<td>+18.2%</td>
<td>7.0***</td>
</tr>
<tr>
<td>I am willing to learn more about food safety.</td>
<td>3.9(0.8)</td>
<td>4.7(0.6)</td>
<td>[0.6,1.1]</td>
<td>+16.4%</td>
<td>6.9***</td>
</tr>
<tr>
<td>I am willing to attend a food safety training course</td>
<td>3.7(0.8)</td>
<td>4.7(0.6)</td>
<td>[0.7,1.3]</td>
<td>+19.6%</td>
<td>7.2***</td>
</tr>
<tr>
<td>I believe that good employee hygiene can prevent foodborne illness.</td>
<td>3.9(0.9)</td>
<td>4.7(0.5)</td>
<td>[0.5,1.1]</td>
<td>+15.7%</td>
<td>5.9***</td>
</tr>
<tr>
<td>It is more important to have tasty food rather than safe food R.</td>
<td>3.9(1.0)</td>
<td>4.5(0.6)</td>
<td>[0.3,0.9]</td>
<td>+11.8%</td>
<td>4.3***</td>
</tr>
<tr>
<td>I think that the manager should regularly educate employees about</td>
<td>3.7(0.8)</td>
<td>4.7(0.6)</td>
<td>[0.7,1.2]</td>
<td>+18.9%</td>
<td>6.5***</td>
</tr>
<tr>
<td>personal hygiene and sanitation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think that it is the responsibility of all food handlers to ensure</td>
<td>3.7 (0.8)</td>
<td>4.7(0.5)</td>
<td>[0.7,1.2]</td>
<td>+18.9%</td>
<td>8.0***</td>
</tr>
<tr>
<td>that the food is safe to serve.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think that only full-time employees should receive food safety</td>
<td>3.9(1.0)</td>
<td>4.6(0.7)</td>
<td>[0.4,1.0]</td>
<td>+14.6%</td>
<td>5.0***</td>
</tr>
<tr>
<td>training R.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I believe that food safety knowledge would make me more confident</td>
<td>3.8 (0.8)</td>
<td>4.7(0.5)</td>
<td>[0.6,1.1]</td>
<td>+17.1%</td>
<td>6.7***</td>
</tr>
<tr>
<td>about my work.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I believe that food safety knowledge benefits not only my work but</td>
<td>3.7 (0.8)</td>
<td>4.7(0.5)</td>
<td>[0.7,1.3]</td>
<td>+20.0%</td>
<td>7.4***</td>
</tr>
<tr>
<td>also my personal life.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am willing to change my food handling behaviors when I know they</td>
<td>3.9(0.9)</td>
<td>4.7(0.6)</td>
<td>[0.5,1.1]</td>
<td>+16.4%</td>
<td>6.0***</td>
</tr>
<tr>
<td>are incorrect.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>3.8 (0.6)</strong></td>
<td><strong>4.7(0.5)</strong></td>
<td><strong>[0.7,1.1]</strong></td>
<td>+17.1%</td>
<td>8.5***</td>
</tr>
</tbody>
</table>

* * p < .001

Scale: 1(Strongly Disagree) to 5(Strongly Agree).

R = reverse-coded items 1(Strongly Agree) to 5(Strongly Disagree)
Table 5.4 Food safety knowledge scores of Chinese-speaking foodservice workers (n=56)

<table>
<thead>
<tr>
<th>Knowledge Topics</th>
<th>Number of items (n)</th>
<th>M(SD) Pre-training</th>
<th>M(SD) Post-training</th>
<th>Post-pre (95% CI)</th>
<th>Percent change</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>5</td>
<td>3.17(1.06)</td>
<td>4.66(0.48)</td>
<td>[1.20,1.77]</td>
<td>+29.64%</td>
<td>10.45***</td>
</tr>
<tr>
<td>Purchasing and receiving</td>
<td>2</td>
<td>0.68(0.47)</td>
<td>1.92(0.25)</td>
<td>[1.11,1.39]</td>
<td>+62.50%</td>
<td>18.22***</td>
</tr>
<tr>
<td>Storing</td>
<td>3</td>
<td>0.68(0.74)</td>
<td>2.70(0.47)</td>
<td>[1.76,2.20]</td>
<td>+66.07%</td>
<td>18.09***</td>
</tr>
<tr>
<td>Thawing</td>
<td>2</td>
<td>0.66(0.61)</td>
<td>1.86(0.35)</td>
<td>[1.03,1.36]</td>
<td>+59.82%</td>
<td>14.55***</td>
</tr>
<tr>
<td>Preparing</td>
<td>2</td>
<td>0.41(0.53)</td>
<td>1.88(0.33)</td>
<td>[1.30,1.63]</td>
<td>+73.21%</td>
<td>18.20***</td>
</tr>
<tr>
<td>Holding</td>
<td>2</td>
<td>0.88(0.72)</td>
<td>2.0(0.00)</td>
<td>[0.93,1.31]</td>
<td>+56.25%</td>
<td>11.77***</td>
</tr>
<tr>
<td>Cooling</td>
<td>2</td>
<td>0.77(0.76)</td>
<td>1.89(0.37)</td>
<td>[0.92,1.33]</td>
<td>+56.25%</td>
<td>11.02***</td>
</tr>
<tr>
<td>Reheating</td>
<td>2</td>
<td>1.38(0.56)</td>
<td>1.80(0.40)</td>
<td>[0.24,0.62]</td>
<td>+21.43%</td>
<td>4.52***</td>
</tr>
<tr>
<td>Service</td>
<td>2</td>
<td>1.39(0.62)</td>
<td>2.00(0.00)</td>
<td>[0.44,0.77]</td>
<td>+30.36%</td>
<td>7.29***</td>
</tr>
<tr>
<td>Cleaning and sanitizing</td>
<td>2</td>
<td>0.55(0.6)</td>
<td>1.93(0.26)</td>
<td>[1.20,1.54]</td>
<td>+68.75%</td>
<td>16.60***</td>
</tr>
<tr>
<td>Pest management</td>
<td>2</td>
<td>0.66(0.67)</td>
<td>2.00(0.00)</td>
<td>[1.16,1.52]</td>
<td>+66.96%</td>
<td>15.00***</td>
</tr>
<tr>
<td>Labeling</td>
<td>2</td>
<td>0.86(0.75)</td>
<td>1.93(0.26)</td>
<td>[0.87,1.27]</td>
<td>+53.57%</td>
<td>10.91***</td>
</tr>
<tr>
<td>Food allergies</td>
<td>2</td>
<td>0.79(0.62)</td>
<td>1.96(0.19)</td>
<td>[1.01,1.34]</td>
<td>+58.92%</td>
<td>14.55***</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>12.87(2.72)</strong></td>
<td><strong>28.50(1.01)</strong></td>
<td><strong>[14.86,16.38]</strong></td>
<td><strong>+52.08%</strong></td>
<td><strong>14.55</strong>*</td>
</tr>
</tbody>
</table>

*** p < .001

Note: Pre=Mean of pre-training test score; Post= Mean of post-training test score; CI=Confidence interval; +, increase.
Total possible knowledge score = 30
Table 5.5 ANOVA results for the influence of demographics on attitudes and knowledge scores before and after training. (n=56)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Post-pre knowledge scores</th>
<th>Post-pre attitude scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean  SD  F-value  p</td>
<td>Mean  SD  F-value  p</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>16.18  0.56  1.8  0.215</td>
<td>0.80  0.14</td>
</tr>
<tr>
<td>Female</td>
<td>15.70  0.72  0.35  0.17</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-27 years or younger</td>
<td>15.44  0.81  0.05  1.96</td>
<td></td>
</tr>
<tr>
<td>28-37 years</td>
<td>15.50  1.33  0.93  0.32</td>
<td></td>
</tr>
<tr>
<td>38-47 years</td>
<td>16.22  0.78  0.97  0.19</td>
<td></td>
</tr>
<tr>
<td>48-57 years</td>
<td>16.10  0.84  0.81  0.20</td>
<td></td>
</tr>
<tr>
<td>58 or older</td>
<td>0  0  0  0</td>
<td></td>
</tr>
<tr>
<td>Education Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>13.50  1.89  1.27  0.46</td>
<td></td>
</tr>
<tr>
<td>Middle school</td>
<td>16.22  0.83  0.55  0.20</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>16.82  0.77  1.01  0.19</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>15.28  0.84  0.15  0.20</td>
<td></td>
</tr>
<tr>
<td>Bachelor’s degree or higher</td>
<td>12.50  1.89  0.14  0.46</td>
<td></td>
</tr>
<tr>
<td>Food service working experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year or less</td>
<td>14.38  1.16  0.23  0.28</td>
<td></td>
</tr>
<tr>
<td>2-5 years</td>
<td>15.29  0.72  0.42  0.17</td>
<td></td>
</tr>
<tr>
<td>6-9 years</td>
<td>17.25  0.74  0.86  0.18</td>
<td></td>
</tr>
<tr>
<td>10-13 years</td>
<td>15.00  1.34  0.96  0.32</td>
<td></td>
</tr>
<tr>
<td>More than 13 years</td>
<td>0  0  0  0</td>
<td></td>
</tr>
<tr>
<td>Have received food safety training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19.60  1.19  0.93  0.29</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15.19  0.48  0.57  0.12</td>
<td></td>
</tr>
</tbody>
</table>

**p <.01
Table 5.6 Self-reported food safety practices of Chinese-speaking foodservice workers (n=56)

<table>
<thead>
<tr>
<th>Items</th>
<th>N</th>
<th>S</th>
<th>A</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>I always wear a clean cloth when I work in my restaurant</td>
<td>0(0.00%)</td>
<td>23(41.1%)</td>
<td>29(51.8%)</td>
<td>4(7.1%)</td>
</tr>
<tr>
<td>I wear a hair restraint cap or hairnet when I work in food service</td>
<td>9(16.1%)</td>
<td>24(24.9%)</td>
<td>22(39.3%)</td>
<td>1(1.8%)</td>
</tr>
<tr>
<td>I wash my hand thoroughly with soap and hot water before working with food.</td>
<td>9(16.1%)</td>
<td>15(26.9%)</td>
<td>31(55.4%)</td>
<td>1(1.8%)</td>
</tr>
<tr>
<td>When I am in doubt about the safety of previously cooked food, I report it to supervisor or manager.</td>
<td>2(3.6%)</td>
<td>11(19.6%)</td>
<td>43(76.8%)</td>
<td>0(0.0%)</td>
</tr>
<tr>
<td>I always use glove or utensils to handle food that is ready-to-eat such as salads.</td>
<td>7(12.5%)</td>
<td>19(33.9%)</td>
<td>23(41.1%)</td>
<td>7(12.5%)</td>
</tr>
<tr>
<td>I use a separate clean utensil for each food item.</td>
<td>0(0.0%)</td>
<td>8(14.3%)</td>
<td>47(83.9%)</td>
<td>1(1.8%)</td>
</tr>
<tr>
<td>I wash my hands and change into a new pair of glove after touching anything that may contaminate my hands when I prepare or serve food</td>
<td>1(1.8%)</td>
<td>6(10.7%)</td>
<td>49(87.5%)</td>
<td>0(0.0%)</td>
</tr>
<tr>
<td>I wash raw produce before using it.</td>
<td>1(1.8%)</td>
<td>11(19.6%)</td>
<td>42(75.0%)</td>
<td>2(3.6%)</td>
</tr>
<tr>
<td>I store raw food in an area separate form cooked food.</td>
<td>0(0.0%)</td>
<td>4(7.1%)</td>
<td>50(89.3%)</td>
<td>2(3.6%)</td>
</tr>
<tr>
<td>I have written down date marking on all ready to eat food and TCS (food requiring time and temperature control for safety).</td>
<td>1(1.8%)</td>
<td>5(8.92%)</td>
<td>48(85.7%)</td>
<td>2(3.6%)</td>
</tr>
<tr>
<td>I pay attention to expiration date on food and do not use foods that have passed the expiration date.</td>
<td>1(1.8%)</td>
<td>8(14.3%)</td>
<td>46(84.1%)</td>
<td>1(1.8%)</td>
</tr>
<tr>
<td>I always use a three-compartment sink for washing pots and pans.</td>
<td>2(3.6%)</td>
<td>3(5.4%)</td>
<td>50(89.3%)</td>
<td>1(1.8%)</td>
</tr>
<tr>
<td>I check concentrations of sanitizing solutions used for sanitizing work surfaces and items washed in the pot and pan sink daily.</td>
<td>2(3.6%)</td>
<td>7(12.5%)</td>
<td>45(80.4%)</td>
<td>1(1.8%)</td>
</tr>
<tr>
<td>I drink and/or eat while I am serving or preparing food a^R</td>
<td>31(55.4%)</td>
<td>13(23.2%)</td>
<td>10(17.9%)</td>
<td>2(3.6%)</td>
</tr>
<tr>
<td>I clean and sanitize work surfaces after each task.</td>
<td>1(1.8%)</td>
<td>13(23.2%)</td>
<td>42(75.0%)</td>
<td>0(0.0%)</td>
</tr>
<tr>
<td>I store chemicals in a non-food storage room</td>
<td>2(3.6%)</td>
<td>7(12.5%)</td>
<td>46(82.1%)</td>
<td>1(1.8%)</td>
</tr>
</tbody>
</table>

^R = reverse coded; N= Never;  S = Sometime;  A= Always;  N/A= Not Applicable
References


CHAPTER 6. GENERAL CONCLUSIONS

The purpose of this study was to assess food safety needs of Chinese-speaking foodservice workers employed in independently-owned Chinese restaurants, and to develop and test the effectiveness of visual-based, minimal-text food safety training materials on food safety attitudes and knowledge of Chinese-speaking foodservice workers. This chapter summarizes study findings, limitations, and suggestions for future research. A summary of key findings of this study is discussed below each research objective.

In phase one, the researcher sought feedback from food safety inspectors in Iowa to assess food safety inspectors’ experiences with conducting food safety inspections in independently-owned Chinese restaurants. Minimal-text visual food safety training materials previously developed by researchers (Rajagopal 2012, 2013; Rajagopal & Strohbehn, 2013; Rajagopal, Arendt, Shaw, Strohbehn, & Sauer, 2015; FDA, 2006) were modified to reflect the 2009 Food Code and the 2011 supplement (FDA, 2009, 2011) (Appendix M-N) which is currently adopted in the state of Iowa. Feedback obtained in phase one was also used to develop new training materials that addressed food safety gaps identified by food safety inspectors. Training materials were used in phase two to train Chinese-speaking foodservice workers in independently-owned Chinese restaurants about critical food safety concepts identified as lacking by the food safety inspectors. Effectiveness of training was assessed before and after training.
Summary of Results

This study aimed at addressing three specific research objectives. A summary of key findings is discussed below each study objective.

Research Objective 1: Evaluate the food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants as viewed by food safety inspectors.

Out of the 45 food safety inspectors invited to participate in this study, 28 completed the questionnaire (62.2%). This study identified many challenges that food safety inspectors face when conducting food safety inspections in independently-owned Chinese restaurants of which language and cultural barriers were identified as major challenges. Language barriers impacted communication with Chinese foodservice workers leading to difficulty in conveying food safety messages one-on-one, explaining food safety practices needing corrections, and providing training. Food safety inspectors suggested conducting food safety training and providing food safety educational tools in the Chinese language that use minimal-text visuals to address food safety challenges, language and cultural barriers when working with Chinese-speaking foodservice workers in independently-owned Chinese restaurants.

Research Objective 2: Assess food safety attitudes, knowledge, practices, and training received of Chinese-speaking foodservice workers in independently-owned Chinese restaurants.

A convenience sample of Chinese-speaking foodservice workers (n=60) was recruited from independently-owned Chinese restaurants in Iowa (n=16) of which 56 foodservice workers agreed to participate (93.3%). Data was collected through paper-based questionnaires administered at the beginning of each training session. Most
participants were female. \((n=50/89.3\%)\) and had worked at the current restaurant for less than a year to more than ten years. Almost all participants never received any formal food safety training \((n=52/92.9\%)\) in their workplace. Average food safety attitudes and knowledge scores were \(12.9\pm2.7\) (out of total possible 30 points) and \(3.5\pm0.6\) (on a 5-point Likert-style scale) respectively. Self-reported food safety practices suggested more than 50\% of foodservice workers were following safe food handling practices. Almost all participants did not have any food safety certification because they were foodservice workers and were not required to have food certification.

**Research Objective 3:** Develop and evaluate the effectiveness of visual-based, minimal-text training materials on food safety attitudes, knowledge, and practices of Chinese-speaking foodservice workers in independently-owned Chinese restaurants.

Minimal-text visual food safety training materials previously developed by researchers (Rajagopal 2012, 2013; Rajagopal & Strohbehn, 2012; Arendt, Strohbehn, Rajagopal, Sauer, & Shaw, 2015; FDA, 2006) were modified to reflect the 2009 Food Code and the 2011 supplement (FDA, 2009, 2011) (Appendix M-N) which is currently adopted in the state of Iowa. Training materials were also developed based on feedback from food safety inspectors in phase one. Food safety training improved food safety attitudes and knowledge scores by 17.1\% and 52.1\% respectively. Improvement in food safety practice scores was not assessed, as there was no observational component in this study that could provide insights into the impact of training on food handling practices. Overall, visual-based, minimal-text food safety training along with hands-on activities was effective in training Chinese-speaking foodservice workers as observed by the increase in overall knowledge and attitudes score.
Conclusions

This study assessed food safety inspectors’ views on food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants and challenges with conducting food safety inspections, and develop and test the effectiveness of visual-based, minimal-text food safety training materials on food safety attitudes and knowledge of Chinese-speaking foodservice workers. Results from phase one suggested many food handling practices of Chinese-speaking foodservice workers in independently-owned Chinese restaurants were of concern to food safety inspectors, and were challenges faced when conducting food safety inspections in these restaurants. Top food safety concerns, critical and non-critical violations were associated with cooking temperatures, temperature holding, date marking, employee health, purchasing from approved sources, and dishwashing. Top challenges faced when conducting food safety inspections in independently-owned Chinese restaurants were language and cultural barriers food safety inspectors believed could be addressed by providing training and training materials in Chinese containing visuals with minimal-text. However, to maintain food safety, food safety inspectors and foodservice managers and workers must work together to address language and cultural barriers.

Assessment of food safety attitudes and knowledge of Chinese-speaking workers showed major concerns even though more than 50% reported they always follow safe food handling practices. This could be because participants were trying to “save face” and gain respect” which is important to Chinese culture. Average food safety attitude scores were 3.5±0.6 on five-point Likert scale, and food safety knowledge scores were an average of 12.9±2.7 out of a possible 30 points before training. After participating in
visual-based training, food safety attitudes and knowledge scores increased by 17.1% and 52.1% respectively. Hence, visual-based food safety training was able to improve food safety attitudes and knowledge scores of participants.

Limitations of the Study

Because this study was carried out in the state of Iowa, findings cannot be generalized to foodservice workers in other parts of the United States. Findings from phase one suggested there were several barriers and challenges food safety inspectors face when conducting food safety inspections in independently-owned Chinese restaurants. Since no known research had examined the barriers and challenges faced by food safety inspectors, it was challenging to compare these results with other studies. In phase two, food safety practice data collected from Chinese-speaking foodservice workers was self-reported hence the results may not be an accurate representation of the practices employed in the restaurant. While, food safety attitudes and knowledge scores improved after visual-based minimal-text training; since the assessment was administered immediately after training, it is unknown if the improvement in attitudes and knowledge scores would be sustained by foodservice workers after a timeperiod (1, 6 or 12 months). A convenience sample was used for both phases of this study that also impacts the generalizability of the findings.

Results suggested language barriers and cultural barriers could be addressed by providing training and training materials in Chinese, which may not always be possible due to unavailability of enough Chinese-speaking food safety inspectors who can travel throughout the state. While, most Chinese people in the United States might speak Mandarin Chinese, some also speak Cantonese Chinese; so providing training in native
language may not always be possible given the diversity of the workforce and numerous languages spoken in the U.S. This highlights the fact training is not the only solution to addressing food safety issues in independently-owned Chinese restaurants or any foodservice establishment.

Recommendations for Future Research

Future research may recruit participants for both phases using random or stratified sampling methods so the results can be generalized. Phase one examined barriers and challenges food safety inspectors faced when conducting food safety inspections in independently-owned Chinese restaurants, future research may explore Chinese restaurant managers/foodservice workers experiences with food safety inspections and ways in which the inspection process can be done to accomplish food safety goals that would meet the needs of restaurants and food safety inspectors. In phase one a web-based questionnaire was used to collect data; using focus groups or interviews may provide an in-depth view of issues/challenges food safety inspectors face.

In phase two, the questionnaire data was self-reported by the participants that may not accurately represent food safety attitudes, knowledge, and practices of Chinese-speaking foodservice workers. A mixed methods research may be utilized to get a holistic view of factors that influence their food safety attitudes, knowledge, and practices. Since assessment of food safety attitudes, knowledge, and practices was done immediately after training, participants may have retained more information as it was “freshly” presented. Retention of knowledge over the course of time could be investigated to determine if visual-based minimal-text training was helpful in retaining knowledge for a longer period. Effect of two methods of training such as in-class text-based instruction versus in-class visual based training on knowledge retention can be explored to assess the
effectiveness of visual-based, minimal-text training. The effect of using visuals tools as an informal training tool (ex: posting posters at strategic locations or one-on-one training with foodservice workers) on food safety attitudes, knowledge and/or practices can also be explored. Observational studies of food handling behaviors after visual-based training would be an excellent way to assess the effectiveness of this training method.

References


APPENDIX A: HUMAN SUBJECTS APPROVAL

APPENDIX B: INFORMED CONSENT LETTER (PHASE 1)

Title of Study: Development and Assessment of Visual-Based Food Safety Training with Chinese-speaking Foodservice Workers in Independently-owned Chinese Restaurants

Investigators: Dawei Li, MS student; Lakshman Rajagopal, PhD

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION
This study seeks to develop and test the effectiveness of visual-based, minimal-text food safety training materials on food safety attitudes and knowledge of Chinese-speaking foodservice workers in independently-owned Chinese restaurants. Findings will aid operations, food safety inspectors and educators in communication of critical food safety messages and help Chinese-speaking foodservice workers improve food safety attitudes, knowledge, and result in safe food handling behaviors. You are being invited to participate in this study because you are a food safety inspector employed with the Iowa Department of Inspections and Appeals and have experience with conducting food safety inspections in independently-owned Chinese restaurants in Iowa.

DESCRIPTION OF PROCEDURES
If you agree to participate in this study, you will be requested to answer 15 questions related to food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants using a web-based questionnaire. The questionnaire will take approximately 15 minutes to complete.

RISKS
There are no foreseeable risks at this time from participating in this study.

BENEFITS
Findings from this study will aid foodservice operations, food safety inspectors, and educators in communicating critical food safety messages to Chinese-speaking foodservice workers. It is hoped that the training materials developed in this study will contribute towards improving food safety attitudes, knowledge, and practices to prevent foodborne illness.

COSTS AND COMPENSATION
You will not have any costs from participating in this study.

PARTICIPANT RIGHTS
Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time.
CONFIDENTIALITY
Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information. To ensure confidentiality to the extent permitted by law, the following measures will be taken: 1) participants will be assigned a unique code and letter and this will be used for data analysis instead of their name. The researchers identified will have access to study data. Data will be kept confidential in a locked office (7E MacKay) and all electronic data will be kept in password protected computer files. All other data will be retained for 3 years before erasure or destruction. If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS
You are encouraged to ask questions at any time during this study.

- For further information about the study contact Dawei Li at 515-708-4249

- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office of Responsible Research, Iowa State University, Ames, Iowa 50011.

Do you agree to participate in this study?
☐ Yes  ☐ No
APPENDIX C: EMAIL SENT TO FOOD SAFETY INSPECTORS (PHASE 1)

First email

Title: Request for participation in Iowa State University food safety study

Dear food safety inspectors,

You are invited to participate in a research survey about *Development and Assessment of Visual-Based Food Safety Training with Chinese-speaking Foodservice Workers in Independently-owned Chinese Restaurants*.

You are being invited to participate in this study because you are a food safety inspector employed with the Iowa Department of Inspections and Appeals and have experience with conducting food safety inspections in independently-owned Chinese restaurants in Iowa. Your contact information was provided by the Iowa Department of Inspections and Appeals.

Findings will aid food safety inspectors, foodservice operations and educators in communication of critical food safety messages to Chinese speaking foodservice workers and help Chinese-speaking foodservice workers improve food safety attitudes, knowledge, and result in safe food handling behaviors.

This questionnaire is part of my thesis project. Your responses will be kept confidential. All the information you provide will be anonymous and for academic use only.

The survey should only take about 15 minutes. The data collected by this survey will help us to assess food safety needs in independently-owned Chinese restaurants in Iowa.

If you have any questions, please contact me at dawei@iastate.edu or call 515-708-4249. By clicking the survey link below, you agree to participate in this research study: https://iastate.qualtrics.com/SE/?SID=SV_5hzjd9KRDOyRgax

Your participation is appreciated.

Thank you,
Dawei Li & Dr. Lakshman Rajagopal
APPENDIX D: REMINDER EMAIL SENT TO FOOD SAFETY INSPECTORS (PHASE 1)

Dear food safety inspectors,

This is a friendly reminder to complete the survey “Development and Assessment of Visual-Based Food Safety Training with Chinese-speaking Foodservice Workers in Independently-owned Chinese Restaurants”

Thank you for taking your valuable time to participate in this important initiative. If you have already completed the questionnaire, please ignore this email.

If you have any questions, please contact me at dawei@iastate.edu or call 515-708-4249. Follow this link to the Survey: https://iastate.qualtrics.com/SE/?SID=SV_5hzjd9KRD0yRgax

Thank you,
Dawei Li & Dr. Lakshman Rajagopal
APPENDIX E: QUESTIONNAIRE FOR FOOD SAFETY INSPECTORS (PHASE 1)

The following questions aim to obtain feedback about your experiences as a food safety inspector when conducting food safety inspections in independently-owned Chinese restaurants in Iowa with the goal of developing food safety training materials for educating Chinese foodservice workers. We realize that not all independently-owned Chinese restaurants are the same, but we intend to explore food safety needs in general in independently-owned Chinese restaurants in the state of Iowa.

1. How many years have you been conducting food safety inspections in Iowa restaurants? (use drop down menu)
   ______ year(s)

2. How many of those years have you conducted food safety inspections in independently-owned Chinese restaurants in Iowa? (use drop down menu)
   ______ year(s)

3. What is the average number of independently-owned Chinese restaurants you inspect every year? (Pull down menu to be added here).

4. During food safety inspections which top five food safety practices do you observe are in compliance with the Food Code in independently-owned Chinese restaurants?

5. Based on your experience with conducting food safety inspections, what are your top five food safety concerns in independently-owned Chinese restaurants?

6. What challenges or barriers (in terms of food safety, personnel, etc) do you face when conducting food safety inspections at independently-owned Chinese restaurants?

7. In your experience, which critical violations and non-critical violations do independently-owned Chinese restaurants have difficulty in correcting after they have been identified during a food safety inspection?
   Critical violations
   
   Non-critical violations
8. Describe an experience (contentious experience and/or leading to shut down of restaurant) you had when conducting a food safety inspection in an independently-owned Chinese restaurant?

9. Based on your experiences with conducting food safety inspections, what food safety and sanitation practices do you think independently-owned Chinese restaurants could improve upon?

10. In your opinion, what type/s of food safety training tools (e.g. posters, demonstrations, etc.) would be helpful to educate Chinese-speaking foodservice workers about safe food handling practices in independently-owned Chinese restaurants?

11. What suggestions do you have for improving the following among Chinese-speaking foodservice workers in independently-owned Chinese restaurants?

   Food safety attitudes (e.g. the importance of food safety, learning about food safety, etc.):  
   Food safety knowledge (e.g. time and temperature control, personal hygiene, etc.):  
   Food safety practices (e.g. glove, handwashing, etc.):

12. What cultural issues (food safety attitudes, risk perception, language, etc) do you face when conducting food safety inspections in independently-owned Chinese restaurants? You can also provide examples to elaborate.

13. In your opinion, how could these cultural issues be addressed (in terms of training provided to Chinese-speaking foodservice workers and/or food safety inspector about conducting food safety inspections in ethnic restaurants, support for food safety inspectors and/or Chinese-speaking foodservice workers) to improve food safety in independently-owned Chinese restaurants?

Demographic questions

What is your age?

- □ 21-30 years    □ 31-40 years    □ 41-50 years    □ 51-60 years
- □ more than 60 years
What is your gender?
□ Female □ Male

What is the highest educational degree attained?
□ Associates
□ Bachelors
□ Masters
□ Doctoral
□ Other (please specify ________________)

Which county/ counties are under your jurisdiction for food safety inspections?
____________________________________________

May I call you if I have follow-up questions? Please provide your contact information below (optional)

Phone________________
Email________________

Thank you for your participation!
APPENDIX F: INFORMED CONSENT FORM FOR EVALUATORS AND TRAINING PARTICIPANTS (PHASE 2)

Informed Consent Letter

Title of Study: Development and Assessment of Visual-Based Food Safety Training with Chinese-speaking Foodservice Workers in Independently-owned Chinese Restaurants

Investigators: Dawei Li, MS student; Lakshman Rajagopal, PhD;

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

This research seeks to develop and test the effectiveness of visual-based, minimal-text food safety training materials when training Chinese-speaking foodservice workers in independently-owned Chinese restaurants. Findings will aid operations, inspectors and in communicating critical food safety messages, and will be able to help improve participants’ food safety knowledge, attitudes and behaviors. You are being invited to participate in this study because you are a Chinese-speaking foodservice worker currently employed in an independently-owned Chinese restaurant in the state of Iowa or an individual with foodservice work experience for evaluating food safety training materials.

DESCRIPTION OF PROCEDURES

If you agree to participate in this study, as an evaluator, you will be invited to evaluate training materials and paper-based questionnaires that test your food safety knowledge, attitudes, and self-reported practices. If you are a training participant, you will be participate in an on-site food safety training session conducted in Mandarin Chinese and complete paper-based questionnaires that test your food safety knowledge, attitudes and practices before and after training. It will take no more than two hours to complete the training and no more than 30 minutes to complete the questionnaires.
过程描述
如果你同意参加本研究，作为培训材料评估者，您会被邀请参加评估测试食品安全知识、态度、和自我实践的培训材料和纸质问卷。如果您是一个培训的参与者，您将会参与全中文的现场食品安全培训，并在培训前后完整的纸质关于食品安全态度和自我实践的调查问卷。培训将不超过 2 小时，问卷调查将花费您大概 20 分钟的时间。

RISKS
There are no foreseeable risks at this time from participating in this study. No restaurant specific information/results will be shared with the managers/owners/staff. If you are interested you will receive a summation of our results (means, standard deviations) after the entire study has been completed. No identifiers will be included.

风险
参加这项研究没有可预见的风险。任何信息和研究结果都不会告知餐厅经理或者员工。如果您感兴趣，我们将会在整个研究结束后把研究结果的总结（平均数，方差）告知。不会包括任何可识别定位的餐厅或者人的因素。

BENEFITS
Direct benefits: If you decide to participate in this study, as an evaluator, you will receive $10 grocery gift card after complete the evaluation of questionnaire and training materials. If you are a training participant, you will receive $10 grocery gift card, a food thermometer, and training materials after training and completing both questionnaires.

Indirect benefits: Findings from this study will aid foodservice operations, food safety inspectors and educators in communicating critical food safety messages to Chinese-speaking foodservice workers. It is hoped that this training method and training materials developed in this study will contribute to improving food safety knowledge, attitudes and practices of Chinese-speaking foodservice workers thereby reducing the incidence of foodborne illness.

利益
直接利益：如果您决定参加本研究，评估培训材料以及问卷者将会收到 10 美元杂货礼品卡，参加培训者并完成两个调查问卷的人将会收到 10 美元杂货礼品卡。
间接利益：研究结果将帮助中国餐厅卫生检查人员和教育工作者在食品安全信息方面的交流，并能够帮助改善中国餐馆中华语餐饮服务人员的食品安全知识、态度和行为，从而减少食源性疾病的发生率。

DESCRIPTION OF COMPENSATION
You will not have any costs from participating in this study.

成本描述
您参与本研究不会有任何成本。
PARTICIPANT RIGHTS
You can have a choice of whether or not to participate. It will have no effect on your employment and participation is not required as part of your job. Your participation in this study is completely voluntary and you can choose to leave the study or decline to participate without any penalties or negative consequences.

CONFIDENTIALITY
Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken: participants will be assigned a unique code and letter and this will be used to tally data instead of their name. The researchers identified will have access to study data. Data will be kept confidential in a locked office (7E MacKay) and all electronic data will be kept in password protected computer files. All other data will be retained for 3 years before erasure or destruction. If the results are published, your identity and restaurants information will remain confidential.

QUESTIONS OR PROBLEMS
You are encouraged to ask questions at any time during this study.

- For further information about the study contact Dawei Li at 515-708-4249; Lakshman Rajagopal 515-294-9740
- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office of Responsible Research, Iowa State University, Ames, Iowa 50011.
问题或问题
我们鼓励您对于这项研究随时问问题。
问询更多信息请联系 李大为 电:515-708-4249 Lakshman Rajagopal 55-294-9740
如果您有任何关于研究对象的权利或研究性的损伤的问题,请联系 IRB 管理
者,(515)294 - 4566,IRB@iastate.edu,或主任(515)294 - 3115 年,负责研究办公室,爱荷
华州立大学,爱荷华州艾姆斯,50011。

***************************************************************
PARTICIPANT SIGNATURE
Your signature indicates that you voluntarily agree to participate in this study, that the
study has been explained to you, that you have been given the time to read the document
and that your questions have been satisfactorily answered. You will receive a copy of the
written informed consent prior to your participation in the study.

参与者签名
你的签名表明你自愿同意参与这项研究。这份文件已经向您清楚解释了这项研究,
您有时间阅读这份知情同意书,并且您的问题已经被满意地回答。您是在参加这项
研究之前收到的这份书面的知情同意书。
Participant’s Name (printed) 参与者的名字(打印) _____________________

________________________________________________________________________

(Participant’s Signature) (参与者签名) (Date) (日期)

INVESTIGATOR STATEMENT
I certify that the participant has been given adequate time to read and learn about the
study and all of their questions have been answered. It is my opinion that the partic
ipant understands the purpose, risks, benefits and the procedures that will be followed in this
study and has voluntarily agreed to participate.

研究者声明
兹证明参与者得到足够的时间阅读和了解学习此项研究，所有的问题已经回答了。
我认为参与者理解本项研究的目的，风险，利益和程序， 并自愿同意参与。

________________________________________________________________________

(Signature of Person Obtaining (Date) (日期)
Informed Consent)

(获得知情同意书的人的签名)
APPENDIX G: PHONE SCRIPT FOR EVALUATORS (PHASE 2)

Phone script for Evaluators

Hello, my name is Dawei Li and I am a graduate student in Hospitality Management at Iowa State University. My research involves the development and testing the effectiveness of visual-based, minimal-text food safety training materials when training Chinese-speaking foodservice workers in independently-owned Chinese restaurants in Iowa.

您好，我是李大为，爱荷华州立大学酒店管理专业的研究生。我正在做一个研究开发并评估针对于在爱荷华州的中国餐馆华语餐饮服务人员的基于视觉的食品安全培训。

I am contacting you to assist with the evaluation foods safety training materials and questionnaires because you are Chinese-speaking individual who have foodservice experience. If you are willing to participate in this study, you will complete the informed consent form, review the training materials and questionnaire for language, clarity, and content, and complete the evaluation form and return this form to Dawei Li, 7 E Mackay Hall. Participants will receive a $10 grocery gift card after evaluating training materials and questionnaires. Participation in this study is voluntary and you can withdraw at any time from this study without any penalties.

我联系您是想得邀请您帮助我们评估食品安全培训材料以及调查问卷，因为您是说中国话的有餐饮服务经验的个体。如果您的员工愿意参加我的这个学习研究，您将会要求完成知情同意书，在语言表达，清楚程度，以及内容上审阅培训材料和问卷调查。在完成审阅培训材料以及调查问卷后，所有的参与者将会得到 10 元的杂货购物礼品卡。

Responses will be kept confidential. All the information you provide will be anonymous and for academic use only.

收集信息与数据将会严格保密，所有的信息只会用于学术研究与交流。

If you have any questions, please contact me at daweili@iastate.edu or call 515-708-4249.

如果您有任何问题，请联系我邮箱：daweili@iastate.edu 电话：515-708-4249

Your participation is appreciated.

非常感谢您能够参与

Thank you
谢谢
APPENDIX H: PHONE SCRIPT FOR CHINESE RESTAURANT OWNERS

(PHASE 2)

Phone script for Chinese restaurant owners

给中国餐厅打电话的电话脚本

Hello, my name is Dawei Li and I am a graduate student in Hospitality Management at Iowa State University. My research involves the development and testing of the effectiveness of visual-based, minimal-text food safety training materials when training Chinese-speaking foodservice workers in independently-owned Chinese restaurants in Iowa.

您好，我是李大为，爱荷华州立大学酒店管理专业的研究生。我正在做一个研究开发并评估针对于在爱荷华州的中国餐馆华语餐饮服务人员的基于视觉的食品安全培训。

I am contacting to you to request your permission to invite your foodservice employees to participate in this study because they are Chinese-speaking foodservice workers in an independently-owned Chinese. If the foodservice workers are willing to participate in this study, they will be participate in an on-site food safety training session conducted in Mandarin Chinese and complete paper-based questionnaires that will assess their food safety knowledge, attitudes and practices before and attitudes after training. Participants will receive a $10 grocery gift card after training and completing both questionnaires. Refreshments will be provided during the training. It will take no more than 2 hours to complete the training and no more than 30 minutes to complete the questionnaires.

我联系您主要是想得到您的允许邀请您的员工参与到我的学习研究中，因为他们是在中国餐厅中的讲中文的餐饮服务人员。如果您的员工愿意参加我的这个学习研究，他们将会参加全中文的食品安全培训，在培训前后完成两张针对于食品安全知识态度和实践的调查问卷。所有的参与者将会得到 10 元的杂货购物礼品卡。培训期间茶点会为您准备好。完成培训将不会超过 2 小时，完成调查问卷将不会超过 30 分钟。

Findings will aid foodservice operations, food safety inspectors, and educators in communication of critical food safety messages to Chinese speaking foodservice workers and help Chinese-speaking foodservice workers improve food safety knowledge, attitudes, and food safe food handling behaviors.

研究的结果不但有助于餐厅，食品安全检查员，教育工作者之间食品安全信息的交流与沟通，而且还有益于提高华语餐饮服务工作者的食品安全知识，态度以及实践。

Responses will be kept confidential. All the information you provide will be anonymous and for academic use only.

收集信息与数据将会严格保密，所有的信息只会用于学术研究与交流。
If you have any questions, please contact me at daweil@iastate.edu or call 515-708-4249.
如果您有任何问题，请联系我邮箱：Daweil@iastate.edu 电话：5157084249

Your participation is appreciated.
非常感谢您能够参与

Thank you
谢谢
视图主导的食品安全培训
Visual-Based Food Safety Training

- 参加全中文的食品安全培训。
- Participate in on-site food safety training session conducted in Mandarin Chinese.
- 完成针对于食品安全知识态度和实践的调查问卷
- Receive a $10 grocery gift card, food thermometer, and training handouts.
- 培训期间茶点会为您准备好。
- Refreshments will be provided during the training.
- 完成培训及问卷将不会超过2.5小时
- Training and questionnaire take no more than 2.5 hours to complete.

如果您有任何问题，请联系我邮箱：Daweil@iastate.edu 电话：5157084249
If you have any questions, please contact me at daweil@iastate.edu or call 515-708-4249.
非常感谢您能够参与
Your participation is appreciated.
谢谢
Thank you
APPENDIX J: EVALUATION FORM FOR VISUAL BASED FOOD SAFETY TRAINING MATERIALS AND QUESTIONNAIRE (PHASE 2)

Directions:
1. Complete the informed consent form.
2. Review the training materials and questionnaire for language, clarity, and content.
3. Complete the evaluation form and return this form to Dawei Li, 7 E Mackay Hall. If you have any questions, please call Dawei Li at 515-708-4249.

Please rate the training materials using the following scale (1 = Strongly Disagree; 3 = Neutral; 5 = Strongly Disagree).

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training materials were easy to view</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training materials were easy to read</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training materials were easy to interpret</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training materials were eye-catching</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>The materials prompted me to pay attention to the message</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content is relevant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. What are the strengths of these training materials?

2. What are the weaknesses of these training materials?

3. What additional comments or suggestions do you have?

Evaluation of questionnaire

1. How long did it take for you to complete the questionnaire?
   Pre-questionnaire _____ minutes
   Post-questionnaire _____ minutes

2. Are there any questions or response options (answers) that are unclear? (please indicate in the questionnaire)

3. What are the strengths of the questionnaire?

4. What are the weaknesses of the questionnaire?

5. What additional comments or suggestions do you have about the questionnaire?
Demographic information
1) Gender
   ______ Male
   ______ Female

2) Age (years)
   ______ 18 – 20
   ______ 21 – 25
   ______ 26 – 30
   ______ 31 – 35
   ______ 36 – and over

3) Do you currently work or have worked in a foodservice operation?
   ______ Yes
   ______ No

4) What type of foodservice operation do you work in?
   ______ University dining
   ______ Restaurant/Café
   ______ School foodservice (K-12 school)
   ______ Hospitals
   ______ Assisted Living/Senior Care Facility
   ______ Other (Please specify __________________)

5) Employment status
   ______ Full-time
   ______ Part-time

6) Time period employed in foodservice: ______ month(s) _______ year(s)

7) Time period employed in this operation: ______ month(s) _______ year(s)

8) Have you received any type of food safety training? ______ Yes ______ No

9) Type of food safety training received: _______________________

Thank you!
问卷

第一部分 您所知道的（食品安全知识）

简介

什么是食源性疾病？
A. 由于吃污染过的食物导致的疾病
B. 由于吃污染过的肉导致的疾病
C. 由于吃污染过的蔬菜导致的疾病
D. 由于吃污染过的水果导致的疾病

什么是温度危险区域？
A. 微生物快速增长的温度区间
B. 微生物停止增长的温度区间
C. 微生物缓慢增长的温度区间
D. 微生物死亡的温度区间

洗手时的最低水温应该是？
A. 85°F (80°C).
B. 100°F (37°C).
C. 125°F (51°C).
D. 150°F (65°C)

为了有效的清洁，洗手过程至少要持续多少时间？
A. 20 秒.
B. 35 秒.
C. 65 秒.
D. 85 秒.

以下哪些是在您餐厅中操作食物时不可以佩戴的？
A. 不露脚趾的鞋
B. 露脚趾的鞋
C. 结婚素戒
D. 围裙

购买与接收

如果你接收没有标明保质期或者使用期的食物，您会怎样做？
A. 将食物倒掉
B. 通过闻食物是否有异味来判断是否可以安全使用
C. 马上用掉这些食物
D. 充分烹饪食物至全熟
接收鲜生肉（鸡肉，牛肉，猪肉）的正确温度是？
A. 32°F (0°C).
B. 41°F (5°C).
C. 50°F (10°C).
D. 70°F (21°C).

储藏
以下哪一个是在午餐和晚餐服务时段放置米饭勺的方法？
A. 把米饭勺放在电饭煲旁的一个盛有水的容器中
B. 把米饭勺放在桌上
C. 把米饭勺放在电饭煲中
D. 把米饭勺放在电饭煲旁的一个没有水的容器中

干货贮藏的室温应该在？
A. 35°F (2°C) to (4°C).
B. 40°F (4°C) to 50°F (10°C).
C. 40°F (4°C) to 60°F (16°C).
D. 50°F (10°C) to 70°F (21°C).

您能储存几天您餐厅所做的酸辣汤？
A. 3 天
B. 5 天
C. 7 天
D. 9 天

解冻
以下哪一项不是适当的解冻方法？
A. 将冷冻的肉放在盘子中然后放入冷鲜箱中
B. 将完整包装的肉放在流动水下解冻 70°F (21°C)
C. 如果很快就会用这块肉，可以用微波炉解冻
D. 放在一个盘子中放在厨房的桌子上解冻

以下哪些食物可以在做饭的过程中进行解冻？
A. 肉.
B. 蔬菜.
C. 生擒.
D. 以上所有都可以.
准备
以下选项哪一个是不必要的？
A. 对于不同的食物比如牛肉，鸡肉，和蔬菜，您必须用不同的菜板。
B. 您需要戴着手套清洗农产品
C. 您需要测量食品内部的温度
D. 在准备食物之前，您必须清洁并消毒食物可能会接触的表面

以下哪一项是正确的？
A. 在同一个水池中清洗不同的蔬菜
B. 在三联水槽中清洗蔬菜
C. 不戴手套操作即食蔬菜
D. 在使用有包装的清洗过的可以直接使用的蔬菜（比如：菠菜，生菜）不需要清洗

保温
在服务午餐或者晚餐时，热菜（比如：陈皮鸡）的最低温度应该保持在多少以上？
A. 115°F (46°C).
B. 125°F (52°C).
C. 135°F (57°C).
D. 145°F (63°C).

在服务午餐或者晚餐时，凉菜（比如：寿司，萨拉）的最高温度应该保持在多少以下？
A. 22°F (-5°C)
B. 32°F (0°C)
C. 41°F (5°C)
D. 45°F (7°C)

冷却
以下哪一个关于冷却炒米饭的正确选项？
A. 把炒米饭放在一个浅盘中然后放入冷鲜箱
B. 把放置炒米饭的锅放在冰水中
C. 把放置炒米饭的锅放在用于放置冷鲜食物的台上
D. 把放置炒米饭的锅放在处于常温的厨房的桌上

为了保证食品安全，冷却食物不应该超过多上时间？
A. 1 小时
B. 2 小时
C. 4 小时
D. 6 小时
加热
以下加热在放在自助餐台上的蛋花汤的最好的方法是？
A. 在自助餐台上加热蛋花汤
B. 在灶台上加热蛋花汤直到165°F (74°C).
C. 将蛋花汤的锅放在热水中加热
D. 将蛋花汤的锅放在烤肉架上加热
重新加热您熬制的用于做辣子鸡的辣酱应该加热到什么温度？
A. 145°F (63°C).
B. 150°F (66°C).
C. 165°F (74°C).
D. 200°F (93°C).

服务
以下哪一项不可以二次使用服务给客人？
A. 用于做装饰的柠檬
B. 没有打开的包装好的筷子
C. 独立包装好的幸运小饼干
D. 装酱油的瓶子
在餐饮服务中，最好拿放被子的方式是
A. 避免拿放/触碰被子的边缘
B. 拿住杯子的杯口
C. 将杯子储存在热水中
D. 将杯子落成一落拿到客人的餐桌前

清洁与消毒
您清洁餐具，厨具，以及餐厅的桌子时的正确顺序与步骤是？
A. 肥皂水清洗，清水冲洗，消毒水消毒
B. 清水冲洗，肥皂水清洗，消毒水消毒
C. 肥皂水清洗，清水冲洗
D. 清水冲洗，肥皂水清洗，清水再冲洗
多长时间应该清洗并消毒一次食物经常接触的表面？
A. 每2小时
B. 每3小时
C. 每4小时
D. 每6小时
害虫管理
当蟑螂出现在餐厅中时，谁应该负责喷洒杀虫剂？
A. 只有餐厅的经理应该负责
B. 害虫防治员应该负责
C. 所有在餐厅工作的员工都可以负责
D. 食品卫生检查员负责
如何防止您餐厅中蚂蚁的侵害？
A. 当发现蚂蚁侵染餐厅的证据时，尽快给害虫防治员打电话
B. 每天清理一遍蚂蚁的巢穴
C. 当怀疑蚂蚁侵袭餐厅时，喷一些防护剂
D. 用密封胶有效的封好所有缝隙，如果需要的话确保门窗紧闭
标签
标记准备的食物应该标出那几项？
A. 食物的名字，准备食物的日期，食物过期的日期，和准备食物的人
B. 食物的名字，准备食物的日期，和食物过期的日期
C. 食物的名字，食物过期的日期，和准备食物的人
D. 食物的名字，和准备食物的人
如果您在 3 月 14 日准备了梅菜扣肉，您最晚应该在几号之前提供给您的顾客？
A. 3 月 21 日
B. 3 月 20 日
C. 3 月 18 日
D. 3 月 16 日
食物过敏
以下关于食品过敏哪一项是正确的？
A. 食物过敏是一种对某些种类食物中蛋白质的不良免疫反应
B. 食物过敏是可以治疗的
C. 食物过敏是消费者对于的一种偏好选择
D. 只有当食物没有烹饪到适当温度时食物过敏才会发生
以下哪一个是主要过敏源？
A. 牛肉
B. 大豆
C. 菠菜
D. 椰子
第二部分 您怎么看？（态度）
说明：请阅读以下陈述。用一下衡量标准圈出您对于以下陈述的态度：
SD=非常不同意；D=不同意；N=保持中立；A=同意；SA=非常同意

<table>
<thead>
<tr>
<th>序号</th>
<th>陈述</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>我认为消毒是我工作中非常重要的一部分。</td>
<td></td>
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<tr>
<td>2</td>
<td>我愿意学习更多关于食品安全的知识。</td>
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<tr>
<td>3</td>
<td>我愿意去参加食品安全培训课程。</td>
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<tr>
<td>4</td>
<td>我相信食品服务员工很好的个人卫生可以预防食源性疾病。</td>
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<tr>
<td>5</td>
<td>食物的味道要比食品安全更重要。</td>
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<tr>
<td>6</td>
<td>我认为餐厅的经理应该定期培训员工个人卫生和餐饮消毒。</td>
<td></td>
<td></td>
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<tr>
<td>7</td>
<td>我相信食物的处理者应该承担起食品安全的责任。</td>
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<td></td>
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<tr>
<td>8</td>
<td>我认为只有全职员工才应该接受食品安全培训。</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>我相信食品安全的知识会让我的工作更加自信。</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>我相信食品安全的知识不仅仅有益于我的工作更有益于我的个人生活</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>11</td>
<td>我愿意去改变我错误的实务操作行为习惯</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
第三部分 您怎么做？（实践）
说明：请阅读以下食品操作行为习惯。用以下衡量标准圈出你对于以下陈述的行为的频繁程度：
N=从不；S=有时；A=经常；N/A=不愿提供

<table>
<thead>
<tr>
<th>序号</th>
<th>陈述</th>
<th>N</th>
<th>S</th>
<th>A</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>我穿着干净的衣服在餐厅中工作</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>2.</td>
<td>我在餐厅工作时我会戴能够盖住头发的帽子或者发网</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>3.</td>
<td>在我操作食物之前我会用温水和肥皂彻底清洁我的双手</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>4.</td>
<td>当我对熟食的食品安全产生质疑时，我会问询我的经理</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>5.</td>
<td>处理即食食物（比如：沙拉）时，我会戴手套或者使用干净的器具</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>6.</td>
<td>我用不同的器具装不同的食物。</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>7.</td>
<td>在我触碰了有可能污染我双手的东西后我会清洗双手换上新的手套</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>8.</td>
<td>在使用生食之前我会将其清洗干净</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>9.</td>
<td>我将生食和熟食分开储存。</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>10.</td>
<td>我会在所有即食食品和 TCS 食品（时间与温度需要严格控制的食品）上标注准备日期</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>11.</td>
<td>我对食品的保质期很注意，不会是使用过期食品。</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>12.</td>
<td>我一直使用三联水槽清洗各种厨具。</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>13.</td>
<td>我每天都会检查用于消毒操作台表面以及洗碗池消毒液的浓度。</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>14.</td>
<td>当我在准备食物的时候会吃喝。</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>15.</td>
<td>在每一项任务完成后我都会清洁并消毒工作台表面。</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
<tr>
<td>16.</td>
<td>我会将化学产品和食物分开储存。</td>
<td>N</td>
<td>S</td>
<td>A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
第四部分 您在哪些方面接受过食品安全培训

说明：请说明您接受过以下哪些方面的食品安全培训，并选择是与否，并指出您接受培训的方式

<table>
<thead>
<tr>
<th>食品安全培训的方面</th>
<th>接受的培训</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>是</td>
</tr>
<tr>
<td>1. 良好的个人卫生方面：</td>
<td></td>
</tr>
<tr>
<td>g. 双手的卫生</td>
<td></td>
</tr>
<tr>
<td>c）正确的洗手方式</td>
<td></td>
</tr>
<tr>
<td>d）保持手部的清洁（比如：剪短指甲，不涂指甲油）</td>
<td></td>
</tr>
<tr>
<td>h. 使用手套</td>
<td></td>
</tr>
<tr>
<td>i. 个人的卫生</td>
<td></td>
</tr>
<tr>
<td>j. 适当的工作穿着（比如：头发的束缚，制服）</td>
<td></td>
</tr>
<tr>
<td>k. 对于疾病的报告</td>
<td></td>
</tr>
<tr>
<td>l. 对于在工作区域吃喝的要求</td>
<td></td>
</tr>
<tr>
<td>2. 个人卫生与疾病传播的关系</td>
<td></td>
</tr>
<tr>
<td>3. 清洁并消毒厨具设备以及工作操作表面的程序步骤</td>
<td></td>
</tr>
<tr>
<td>4. 清洁并消毒餐具以及杯具的程序步骤</td>
<td></td>
</tr>
<tr>
<td>5. 防止交叉污染</td>
<td></td>
</tr>
<tr>
<td>6. 在服务客人时保护食品</td>
<td></td>
</tr>
<tr>
<td>c. 控制食物的温度</td>
<td></td>
</tr>
<tr>
<td>d. 安全服务的步骤</td>
<td></td>
</tr>
<tr>
<td>7. 细菌可以在安全危险区域快速地繁衍增长</td>
<td></td>
</tr>
<tr>
<td>8. 用温度计来测量食品的温度</td>
<td></td>
</tr>
<tr>
<td>9. 在餐厅中不同化学产品的使用以及如何安全的储存</td>
<td></td>
</tr>
</tbody>
</table>

第五部分 关于您自己？（个人信息）

1. 您的性别是?
   A. 女
   B. 男
2. 你的年龄是？
   A. 18-27 岁或更年轻
   B. 28-37 岁
   C. 38-47 岁
   D. 48-57 岁
   E. 58 岁或更年长

3. 哪一个更能解释您的教育水平？
   A. 小学
   B. 初中
   C. 高中
   D. 大学
   E. 拥有大学本科学位或更高

4. 您在食品服务行业工作了多少年了？
   A. 1 年或更少
   B. 2-5 年
   C. 6-9 年
   D. 10-13 年
   E. 超过 13 年

5. 您在当前的工作餐厅工作了多少年了？
   A. 1 年或者更少
   B. 2-5 年
   C. 6-9 年
   D. 10-13 年
   E. 超过 13 年

6. 您以前接受过任何类型的食品安全培训吗？
   A. 是
   B. 否

7. 在您当前的工作的餐厅中您接受过几次食品安全培训？
   ____________次

8. 您是否有食品安全证书？
   A. 是
   B. 否

谢谢您的参与
APPENDIX L: FOOD SAFETY QUESTIONNAIRE FOR FOODSERVICE WORKERS – ENGLISH (PHASE 2) Questionnaire

Part I: What do you know? (Knowledge)

Introduction

What is a foodborne illness?
A. Illness caused by eating any food that is contaminated.
B. Illness caused by eating only contaminated meat.
C. Illness caused by eating only contaminated vegetables.
D. Illness caused by eating only contaminated fruits.

What is the Temperature Danger Zone (TDZ)?
A. The temperature range in which germs grow rapidly.
B. The temperature range in which germs do not grow anymore.
C. The temperature range in which germs grow slowly.
D. The temperature range in which germs die.

What should be the minimum temperature of water when washing hands?
A. 85°F (80 °C).
B. 100°F (37 °C).
C. 125°F (51°C).
D. 150°F (65°C).

How long should you wash your hands so they are completely clean and safe to handle food?
E. 20 seconds.
F. 35 seconds.
G. 65 seconds.
H. 85 seconds.

Which of the following should you not wear when handling food in your restaurant?
A. Close-toe shoes.
B. Open-toe shoes.
C. Plain wedding ring.
D. Apron.

Purchasing and Receiving

What should you do if you find food in the cooler that does not have used by or expiration date?
A. Discard the food.
B. Smell the food to determine if it is safe to use.
C. Use the food immediately.
D. Cook the food to a high temperature to kill all germs.
At what temperature should fresh meat (e.g. chicken, beef, and pork) be received?
E. 32°F (0°C).
F. 41°F (5°C).
G. 50°F (10°C).
H. 70°F (21°C).

**Storing**
Which is the correct method of storing a rice scoop that is used to serve cooked rice during lunch or dinner service?
A. Store rice scoop in a container with water next to the rice cooker.
B. Store rice scoop on the table.
C. Store rice scoop in the rice cooker.
D. Store rice scoop in a container without water next to the rice cooker.

A room used for storing dry goods (flour, dry noodles, e.g.) should be kept at what temperature?
A. 35°F (2°C) to (4°C).
B. 40°F (4°C) to 50°F (10°C).
C. 40°F (4°C) to 60°F (16°C).
D. 50°F (10°C) to 70°F (21°C).

How long can hot and sour soup stored before it must be discarded?
A. 3 days.
B. 5 days.
C. 7 days.
D. 9 days.

**Defrosting**
Which of the following is the incorrect method of defrosting meat?
A. Placing meat in a pan and then putting in the refrigerator.
B. In intact packaging under running water under 70°F (21°C).
C. In the microwave oven if cooking the meat immediately.
D. Placing meat in a pan on the kitchen table.

Which of the following foods can be defrosted as part of the cooking process?
A. Meat
B. Vegetables
C. Poultry
D. All of the above

**Preparing**
Which of following practice is not necessary?
A. Using different chopping boards for different types of foods such as beef, chicken, and vegetables.
B. Wearing gloves when washing produce.
C. Using a food thermometer to measure the internal temperature of food.
D. Cleaning and sanitizing surfaces before and after preparing food.
Which of following practice is correct?
A. Washing different vegetables in a sink at the same time.
B. Washing vegetables in a three compartment sink.
C. Handling ready to eat vegetables without gloves.
D. Using packaged, washed, ready to use vegetables (e.g. spinach, lettuce) without washing.

**Holding**

At what minimum temperature should hot food (e.g orange chicken) be kept at during lunch and dinner service?
A. 115°F (46°C).
B. 125°F (52°C).
C. 135°F (57°C).
D. 145°F (63°C).

At what minimum temperature should cold food (e.g. sushi, salad) be kept at during lunch and dinner service?
A. 22°F (-5°C)
B. 32°F (0°C)
C. 41°F (5°C)
D. 45°F (7°C)

**Cooling**

A food handler can cool fried rice by doing which of the following?
A. Putting fried rice in shallow pans and placing pans in the cooler.
B. Placing the pan of fried rice in ice water.
C. Placing the pan of fried rice in equipment used to serve cold food.
D. Placing the pan of fried rice on the kitchen table at room temperature

Cooling food should take no more than a total of how many hours to keep the food safe?
A. 1 hour.
B. 2 hours.
C. 4 hours.
D. 6 hours.

**Reheating**

Which of the following is the best way to reheat a pot of egg drop soup for serving at a buffet?
A. Reheat the pot of egg drop soup in the equipment used to serve hot food.
B. Reheat the stockpot of egg drop soup on the stove till it reaches a temperature of 165°F (74°C).
C. Reheat the stockpot of egg drop soup in a pan of hot water.
D. Reheat the stockpot of egg drop soup on a hot grill.
To what temperature should you reheat chili sauce used for cooking Szechwan Chili Chicken?
A. 145°F (63°C).
B. 150°F (66°C).
C. 165°F (74°C).
D. 200°F (93°C).

Service
Which of following cannot be re-served to customers?
A. Lemon used as a garnish.
B. Unopened packet of chopsticks
C. Fortune cookies in intact individual wrappers
D. Soy sauce in bottles.

What is the best way to handle glasses/cups during service?
A. Avoiding holding/touching the rim of the glasses/cup.
B. By holding the mouth of the glass/cup.
C. Wiping glasses/cup before using for service.
D. Stacking glasses/cups and take to the table for service.

Cleaning and Sanitizing
In which order should you clean and sanitize utensils and surfaces in your restaurant?
A. First wash with soap, rinse with water, and sanitize with sanitizer.
B. First rinse with water, wash with soap, and sanitize with sanitizer.
C. Wash with soap and rinse with water
D. First rinse with water, wash with soap and rinse with water.

How often should food-contact surfaces that are in constant use be cleaned and sanitized?
A. Every 2 hours.
B. Every 3 hours.
C. Every 4 hours.
D. Every 6 hours.

Pest Management
Who should apply chemicals in your restaurant to prevent pests from thriving in the restaurant??
A. Restaurant manager.
B. Pest control operator.
C. Foodservice worker.
D. Food safety inspector.

What can you do to deny access to ants in your establishment?
A. Call the pest control operator.
B. Remove ant colonies on a daily basis.
C. Spray bleach solution around the restaurant.
D. Effectively seal all cracks, crevices with sealant and ensure doors/windows are closed.
**Labeling**
Which of the following would be good to include when labeling food?

A. Name of food, date the food was prepared, discard by date, and name of person who prepared the food.
B. Name of food, date of food was prepared, and discard by date.
C. Name of food and person who prepared the food.
D. Name of food, expiration date, and person who prepared the food.

If you prepared a fresh batch of Braised pork with preserved vegetable on March 14, you would want to serve it by which date?

A. March 21
B. March 20
C. March 18
D. March 16

**Food allergies**
Which of the following is correct about food allergies?

A. A food allergy is an adverse immune response to proteins in foods.
B. Food allergies are curable.
C. Food allergies are a personal choice that customers make.
D. Food allergy only happens when food is improperly cooked.

Which of the following is a major food allergen?

A. Beef.
B. Soy.
C. Spinach.
D. Coconut.
**Part II What do you think? (Attitudes)**

**Instructions:** Please read each statement. Indicate your agreement to the statement by circling your response, using the following scale:

SD = Strong Disagree;  D = Disagree;  N = Neutral;  A = Agree;  SA = Strong Agree

<table>
<thead>
<tr>
<th>Items</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I think sanitation is an important part of my job responsibilities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. I am willing to learn more about food safety.</td>
<td></td>
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<tr>
<td>3. I am willing to attend a food safety training course</td>
<td></td>
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<tr>
<td>4. I believe that good employee hygiene can prevent foodborne illness.</td>
<td></td>
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<tr>
<td>5. It is more important to have tasty food rather than safe food</td>
<td></td>
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<tr>
<td>6. I think that the manager should regularly educate employees about personal hygiene and sanitation.</td>
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<tr>
<td>7. I think that it is the responsibility of all food handlers to ensure that the food is safe to serve.</td>
<td></td>
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<tr>
<td>8. I think that only full-time employees should receive food safety training.</td>
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<tr>
<td>9. I believe that food safety knowledge would make me more confident about my work.</td>
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<tr>
<td>10. I believe that food safety knowledge not only benefits my work but also my personal life.</td>
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</tr>
<tr>
<td>11. I am willing to change my food handling behaviors when I know they are incorrect.</td>
<td></td>
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</tr>
</tbody>
</table>
**Part III What do you do? (Practices)**

**Instructions:** Please read each food handling behavior performed at work. Indicate the frequency in which you engage in this practice by circling your response, using the following scale:

- **N** = Never;  **S** = Sometime;  **A** = Always;  **N/A** = Not Applicable

<table>
<thead>
<tr>
<th>Items</th>
<th>N</th>
<th>S</th>
<th>A</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>I always wear a clean cloth when I work in my restaurant</td>
<td></td>
<td></td>
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<tr>
<td>I wear a hair restraint cap or hairnet, when I work in food service</td>
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</tr>
<tr>
<td>I wash my hand thoroughly with soap and hot water before working with food</td>
<td></td>
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<tr>
<td>When I am in doubt about the safety of previously cooked food, I report it to supervisor or manager.</td>
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</tr>
<tr>
<td>I always use glove or utensils to handle food that is ready-to-eat such as salads.</td>
<td></td>
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</tr>
<tr>
<td>I use a separate clean utensil for each food item.</td>
<td></td>
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</tr>
<tr>
<td>I wash my hands and change into a new pair of glove after touching anything that may contaminate my hands, when I prepare or serve food</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I wash raw produce before using it.</td>
<td></td>
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<tr>
<td>I store raw food in an area separate from cooked food.</td>
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<tr>
<td>I have written down date marking on all ready to eat food and TCS (food requiring time and temperature control for safety).</td>
<td></td>
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<tr>
<td>I pay attention to expiration date on food and do not use foods that have passed the expiration date.</td>
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<tr>
<td>I always use a three-compartment sink for washing pots and pans.</td>
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<tr>
<td>I check concentrations of sanitizing solutions used for sanitizing work surfaces and items washed in the pot and pan sink daily.</td>
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<tr>
<td>I drink and/or eat while I am serving or preparing food.</td>
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<tr>
<td>I clean and sanitize work surfaces after each task.</td>
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<tr>
<td>I store chemicals in a non-food storage room.</td>
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</tbody>
</table>
### Part IV: On which topics have you received food safety training

**Instructions:** Please indicate which of the following food safety topics was included in the food safety training you have received by checking *Yes* or *No*. Please indicate the method/s in which you received the training.

<table>
<thead>
<tr>
<th>Food Safety Topic</th>
<th>Training received</th>
<th>Method in which you received training (Example: in-class training, on-the-job training, videos, etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>1. Components of good personal hygiene:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Hygienic hand practices</td>
<td></td>
<td></td>
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<tr>
<td>a) Proper hand washing</td>
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<tr>
<td>b) Hand maintenance (e.g. fingernails, nail polish)</td>
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<tr>
<td>b. Use of gloves</td>
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<tr>
<td>c. General personal cleanliness (e.g. clothing)</td>
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<tr>
<td>d. Proper work attire (e.g. hair restraint, uniform)</td>
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<tr>
<td>e. Reporting illness and injury</td>
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<td></td>
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<tr>
<td>f. Policies regarding eating and drinking in work area</td>
<td></td>
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<tr>
<td>2. The relationship between personal hygiene and the spread of disease</td>
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<tr>
<td>3. Procedures for cleaning sanitizing utensils equipment and food contact surfaces</td>
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<tr>
<td>4. Procedures for cleaning and sanitizing glassware, silverware, and dishes.</td>
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<tr>
<td>5. Preventing cross contamination</td>
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<tr>
<td>6. Protecting food during service</td>
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<td></td>
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<tr>
<td>e. Holding food for service</td>
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<tr>
<td>f. Safe serving procedures</td>
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<tr>
<td>7. Temperature danger zone the relationship with growth of microorganisms</td>
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<td></td>
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<tr>
<td>8. Use of thermometer and taking temperature of food</td>
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<td></td>
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<tr>
<td>9. Type of chemical used in the dining center and how to safely store use</td>
<td></td>
<td></td>
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</tbody>
</table>
Part V What about you? (Demographic information)

1. What is your gender?
   _____Female
   _____Male

2. What is your age?
   _____18-27 years or younger
   _____28-37 years
   _____38-47 years
   _____48-57 years
   _____58 or older

3. Which of the following best describes your education level?
   _____Primary school
   _____Middle school
   _____High school
   _____Some college
   _____Bachelor’s degree or higher

4. How many years have you been working in the foodservice industry?
   _____1 year or less
   _____2-5 years
   _____6-9 years
   _____10-13 years
   _____More than 13 years

5. How many years have you been employed in this current restaurant?
   _____1 year or less
   _____2-5 years
   _____6-9 years
   _____10-13 years
   _____More than 13 years

6. What type of employee are you?
   _____Full-time employee (work 40 hours or more)
   _____Part-time employee (work less than 40 hours)

7. Have you ever received any type of food safety training?
   _____Yes
   _____No
8. In your current job, how many times have you received formal food safety training?
   _______ time (s)

9. Do you have any food safety certification?
   _____ Yes
   _____ No

   Thank you for participating in this study
APPENDIX M: VISUAL-BASED FOOD SAFETY TRAINING HANDOUTS – ENGLISH & CHINESE (PHASE 2)

Clean.
Wash hands, utensils, and cutting boards before and after contact with raw meat, poultry, seafood, and eggs.

Separate.
Keep raw meat and poultry apart from foods that won’t be cooked.

Cook.
Use a food thermometer— you can’t tell if food is cooked safely by how it looks.

Chill.
Chill leftovers and takeout foods within 2 hours and keep the fridge at 40°F or below.

清潔.
在處理生肉、生禽、海鮮、雞蛋的前後要清潔雙手、用具，以及菜板。

分離.
生禽肉、生肉與即將食用的食品分開存放。

烹調.
使用食物溫度計-您不能根據肉類的色澤來判斷食物是否熟透。

冷藏.
在2小時內冷卻剩餘食物和外帶食物，放入溫度在40°F (4°C)以下冰箱中。

Wash those hands! Here is how

1. Wet hands with hot running water.
2. Apply soap.
4. Clean under fingernails and between fingers.
5. Rinse hands thoroughly under running water.
6. Dry hands with disposable paper towel or hand dryer.

Correct hand washing steps:

1. Wash hands with warm water.
2. Remove soap.
4. Dry hands with a paper towel or hand dryer.

How to Calibrate a Thermometer?

Why? Properly calibrated thermometers measure correct minimum internal temperatures of food and help maintain food safety.

- Add clean ice into a glass
- Add clean water to the glass
- Wait for 2 minutes
- Hold thermometer in ice water
- Insert sensing area in water
- Adjust till thermometer reads 32°F/0°C

It should read 32°F/0°C

How to Calibrate a Thermometer?

Why? Properly calibrated thermometers measure correct minimum internal temperatures of food and help maintain food safety.

- Add clean ice into a glass
- Add clean water to the glass
- Wait for 2 minutes
- Hold thermometer in ice water
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It should read 32°F/0°C

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It should read 32°F/0°C

How to Calibrate a Thermometer?

Why? Properly calibrated thermometers measure correct minimum internal temperatures of food and help maintain food safety.

- Add clean ice into a glass
- Add clean water to the glass
- Wait for 2 minutes
- Hold thermometer in ice water
- Insert sensing area in water
- Adjust till thermometer reads 32°F/0°C

It should read 32°F/0°C
How to Measure Temperature of Food Using a Food Thermometer?

1) Insert clean and sanitized thermometer into the center of the food and measure temperature.
2) Keep thermometer in the food until the dial does not move and holds the temperature steady for at least 15 seconds.

How to Clean and Sanitize a Thermometer?

- Use alcohol wipes or Wash/Rinse/Sanitize solution
- Wipe thermometer stem with alcohol wipes
- Use Wash, Rinse, and Sanitize solution

Never wipe thermometer on clothes/apron/kitchen towel

Cleaning and Sanitizing Using a Three-Compartment Sink

- Wash (100°F/38°C)
- Rinse
- Sanitize (Water temperature will depend on the type of sanitizer you use)

Trash can

如何使用温度计测量食品的温度？

1) 插入干净并消毒的温度计至食物中央测量食物的温度。
2) 让温度计保持插在食物中直到指针不在变化至少让温度计保持在食物中15秒。

如何清洁并消毒温度计?

- 使用酒精或其他清洁方法清洁温度计
- 使用酒精擦洗温度计
- 使用消毒清洗消毒剂

永远不要在衣服或围裙上擦温度计

清洁与消毒的应用—三联水槽

- 清洗
- 冲洗（温度取决于您使用的消毒液的要求）
- 消毒
- 垃圾桶
- 洗涤
- 洗涤
- 水龙头
APPENDIX N: FOOD SAFETY TRAINING POWERPOINT PRESENTATION - CHINESE (PHASE 2)

Visual-Based Food Safety Training

English version

Dawei Li  MS student

Agenda

1. Introduction
2. Completion of informed consent form (10 mins) and pre-training questionnaire (15 mins)
3. Food safety training and activities (40 mins)
4. Break (10 mins)
5. Food safety training and activities (40 mins)
6. Post-training questionnaire (10 mins)

Overview of foodborne illness

Illness caused by eating any food that is contaminated.

Facts

• 48 million get sick by eating contaminated food.
• Hospitalizations: 128,000
• Deaths: 3,000
• Most illness result from eating away from home.

1 in 6

Training Model

視圖主导的食品安全培训材料

李大为  研究生

培训议程

1. 简介
2. 完成知情同意书(10 分钟) 完成培训前的调查问卷 (15 分钟)
3. 食品安全培训以及活动(40 分钟)
4. 休息 (10 分钟)
5. 食品安全培训以及活动(40 分钟)
6. 完成培训后的调查问卷 (15 分钟)

食源性疾病概述

由于吃被污染的食物所产生的疾病

实例

• 四千八百万由于吃了被污染的食物生病。
• 住院: 128,000
• 死亡: 3,000
• 大部分的人是因为在外面吃了不干净的食物。
Cost of Foodborne Illness
- Loss of customer and sales
- Loss of reputation
- Negative media exposure
- Low staff morale
- Lawsuits and legal fees
- Staff missing work
- Increased insurance
- Staff retraining

Overview of foodborne illness
Three types of contaminants that can cause foodborne illness:
- Physical
- Biological
- Chemical

Types of Microorganisms

微生物的种类

三种可以导致食源性疾病污染的污染物：
- 物理性
- 生物性
- 化学性
Conditions that Promote Growth of Germs

1. Food
2. Acidity
3. Temperature (Temperature Danger Zone)
4. Time
5. Oxygen
6. Moisture

Food Allergies
- The body's negative reaction to a protein in food.
- More than 50 million Americans have some type of food allergy.
- Any food can cause an allergic reaction.
- Not consuming the allergen is the only method of prevention.

How to Prevent Foodborne Illness
1. Purchase food from approved supplies
2. Practice good personal hygiene
3. Prevent cross contamination
4. Prevent time and temperature abuse
5. Practice proper cleaning and sanitizing

如何防御食源性疾病
1. 向合格信誉佳的供应商采购食品
2. 保持良好的个人卫生
3. 避免交叉污染
4. 避免时间与温度的滥用
5. 实践清洁与消毒
Hand Washing Activity

Directions
- Apply and rub lotion onto hands.
- Divide into groups:
  a) Not wash hands
  b) Wash with cold water only
  c) Wash with soap + cold water
  d) Wash with hot water only
  e) Wash with soap + hot water
  f) Wash hands with hand sanitizer
  g) Wipe hands with paper towel (no handwashing)
- View hands under blue light.

Wash those hands! Here is how

1. Wet hands with hot running water.
2. Apply soap.
4. Clean surfaces and between fingers.
5. Rinse hands thoroughly under running water.
6. Dry hands with disposable paper towel or hand dryer.

If you wear gloves or use utensils when handling ready-to-eat foods, you keep the food and your customers safe.

Protect people from getting sick. Always wear gloves or use utensils when handling ready-to-eat foods.
Know Your Thermometer

Bimetallic Stemmed Thermometer

- Indicator Head
- Calibration Nut
- Holding Clip
- Stem
- Sighting Area
- Dimple

How to Calibrate a Thermometer?

Why? – Properly calibrated thermometers measure correct minimum internal temperatures of food and help maintain food safety.

1. Add clean ice to a glass.
2. Add clean water to the glass.
3. Wait for 2 minutes.
4. Hold thermometer in ice water.
5. Insert sensing area in water.
6. Adjust 88 thermometer reads 32°F.

It should read 32°F/0°C

How to Measure Temperature of Food Using a Food Thermometer?

1. Insert clean and sanitized thermometer into the center of the food and measure temperature.
2. Keep thermometer in the food until the dial does not move and holds the temperature steady for at least 15 seconds.

了解您的温度计

双金属棍状温度计

- 把头
- 螺母
- 夹子
- 底
- 视野
- 气泡

如何矫正温度计

为什么？– 正确的矫正温度计，测量正确的食物内部的最低温度，帮助保持食品安全。

1. 将温度计放入干净的冰块。
2. 加入使液体温度为32°F。
3. 等待2分钟。

读数应该为32°F/0°C

如何使用温度计测量食品的温度？

1. 插入干净并消毒的温度计至食物中心测量食物的温度。
2. 让温度计保持插入食物中直到温度变化后两秒再让温度计保持原食物中15秒。
How to Clean and Sanitize a Thermometer?

- Use alcohol wipes or Wipe thermometer stem with alcohol wipes
- Use wash, rinse, and Sanitize solution
- Never wipe thermometer with clothes or towels

Review and Break

Flow of Food – The Journey of Food in your Restaurant

- Purchasing
- Receiving
- Storing
- Preparing
- Cooking
- Holding
- Cooling
- Reheating
- Serving

食物的流程 – 您餐厅中食物的历程

- 采购
- 接收
- 储存
- 冷却
- 加热
- 服务
Purchasing and Receiving
Purchase from approved reputable suppliers

Receiving check list:
1. Temperature (TDZ)
2. Package (Damage, Liquid, Pests, Dotes)
3. Documents and stamps
4. Food quality
5. Used by/Expiration date

Storage
- Labeling (Name, prepared by and discard by date, who prepared)
- Discard cooked food after 7 days (includes date of preparation)
- Dry foods temperature 50°F (10°C) to 70°F (21°C)
- Date marking and cycling (FIFO)
- Cooler temperature (TDZ) 41°F (5°C)
- Location: 6 inches (15 cm) from floor
- Preventing cross contamination

Storage - Do’s & Don’t

Foods

Utensils and equipment

Storage

采购与接收
向合格信誉佳的供货商采购食品

接受食品检查清单
1. 温度 (接收温度在危险安全区内的食物)
2. 包装 (破损, 液体溢出, 虫咬痕迹，日期)
3. 合格文件与印章
4. 食品的质量
5. 生产日期与保质期

储存
- 标记 (食品名称, 食品准备日期和丢弃日期, 准备的)
- 七天后需丢弃做好的食物 (查看食物准备日期)
- 干燥食物储存温度50°F (10°C) to 70°F (21°C)
- 日期的标注与循环 (先入先出)
- 冰箱温度(温度危险区域) 41°F (5°C)
- 储存地点: 离地面6英寸 (15 厘米)
- 防止交叉污染

储存对与错

食物

餐具与器皿
**Thawing Food**

The Four Acceptable Methods for Thawing Food

- In a refrigerator at 41°F (5°C) or lower
- Submerged in saltwater, using only enough salt to lower the temperature to 32°F (0°C) or lower
- In a microwave, if the food will be cooked immediately after thawing
- As part of the cooking process

**Cooking and Reheating**

<table>
<thead>
<tr>
<th>Cooking</th>
<th>Reheating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>Time &amp; temperature</td>
</tr>
<tr>
<td>Poultry and TCS</td>
<td>15 s</td>
</tr>
<tr>
<td>Ground meat</td>
<td>15 s</td>
</tr>
<tr>
<td>Seafood</td>
<td>15 s</td>
</tr>
<tr>
<td>Meat (beef, lamb, pork)</td>
<td>4 minutes</td>
</tr>
<tr>
<td>Ready-to-eat food/vegetable</td>
<td>135°F (57°C)</td>
</tr>
</tbody>
</table>

**Holding Food**

- Keep **hot foods hot**, and **cold foods cold** to keep food out of the Temperature Danger Zone.

**解冻食物**

四种可以接受的解冻食物的方法

- 在冰箱中解冻，温度在41°F (5°C)或更低
- 在盐水中解冻，只使用足够的盐来降低温度到32°F (0°C)或更低
- 在微波炉中解冻，如果食物会立即在烹饪过程中解冻
- 作为烹饪过程的一部分

**烹饪与在加热**

<table>
<thead>
<tr>
<th>烹饪</th>
<th>烹饪与温度</th>
<th>时间</th>
<th>温度</th>
</tr>
</thead>
<tbody>
<tr>
<td>肉类</td>
<td>15秒</td>
<td>165°F (74°C)</td>
<td></td>
</tr>
<tr>
<td>肉类</td>
<td>15秒</td>
<td>212°F (100°C)</td>
<td></td>
</tr>
<tr>
<td>鱼类</td>
<td>15秒</td>
<td>145°F (63°C)</td>
<td></td>
</tr>
</tbody>
</table>

**食品温度保持**

- **热食保温**, **冷食冷藏**, 保证食品的温度在温度危险区域之外
Serving Customers with Food Allergies

1. Server should ask customer if they have any food allergies.
2. Identify allergens on the menu upon customer request.
3. If unsure, ask kitchen staff.
4. Inform kitchen staff about customer's with allergies.

Serving Food Safely: Servers
Handling Dishes and Glassware

Wrong Right Wrong Right
Wrong Right Wrong Right

服務于特定食品過敏的客人

1. 服務生應該詢問客人是否有過敏性食物（是否有忌口）
2. 根據客人需求確定菜單中客人忌口的食物，如果不清楚，請問問廚房工作人員
3. 告知廚房工作人員客人的忌口需求。
Serving Food Safely: Servers

Handling Utensils and Food

- **Wrong**
- **Right**

Why it's Important to Cool Food Properly

Protect People Everywhere.  Cool Food Properly.

Cooling

- Method for cooling food
  - Ice-water bath
  - Ice paddle
  - Blast or Tumble chiller
  - Ice or cold water as an ingredient

**DO NOT** place hot food in the refrigerator or leave food at room temperature to cool.

- Cool food within a total of 6 hours
- 2 hours from 135°F (57°C) to 70°F (21°C)
- 4 hours from 70°F (21°C) to 41°F (5°C)

冷却

- 冷却食物的方式
  - 冰水浸泡
  - 冰桨
  - 冷却机
  - 加入冰或冰水

将食物放在常温下进行冷却
- 冷却食物不能超过6小时
- 2小时内从135°F (57°C) 降到 70°F (21°C)
- 4小时内从70°F (21°C) 降到 41°F (5°C)
Cleaning and Sanitizing Using a Three-Compartment Sink

1) Wash
2) Rinse
3) Sanitize

(Water temperature will depend on the type of sanitizer you use.)

Cleaning and Sanitizing - Surfaces

1) Wash
2) Rinse
3) Sanitize

Cleaning with disposable gloves—三联水槽

1) 清洗
2) 冲洗
3) 消毒

(水温取决于你使用的消毒剂。)

How to Prepare Cleaning and Sanitizing Solutions?

1) Cauter solution
2) Sanitize water
3) Rinse water
4) Sanitize solution
5) Check concentration

How to Prepare Cleaning and Sanitizing Solutions?

1) 清洗溶液
2) 消毒溶液
3) 冲洗溶液
4) 检查浓度

(正确溶液的浓度是适当的。)
Chemical Storage

- Store chemical away from foods
- Only use chemical for appropriate tasks

How to clean and sanitize surfaces?

- Prepare cleaning and sanitizing solutions
- Clean dirty surface with detergent solution
- Rinse surface with clean water
- Sanitize with sanitizing solution
- A spray bottle may also be used

Food-contact surfaces that are in constant use should be cleaned and sanitized every 4 hours or earlier if they get dirty.

Pest management

- Do not apply chemicals on your own.
- Call licensed Pest Control Operator.

害虫管理

- 不要自己使用任何清理害虫的化学试剂
- 给有执照的害虫管制员打电话。
Review

- Maintaining food safety is critical for consumer safety and protecting business.
- Practicing good personal hygiene is key to preventing foodborne illness.
- Prevent time and temperature abuse of food by defrosting, cooking, cooling, reheating, and serving food at appropriate temperatures.
- Prevent cross-contamination.
- Practice proper cleaning and sanitizing of equipment and surfaces.
- Train employees about food allergies.
- Maintain equipment and facilities on a regular basis.
- You can be a positive role model by encouraging safe food handling practices among your employees and preventing foodborne illness!!

Thank you!
Any questions?

For more free training resources check www.iowafoodsafety.org