

## FOOD SAFETY NEEDS IN INDEPENDENTLY-OWNED CHINESE RESTAURANTS: FOOD SAFETY INSPECTORS' PERSPECTIVE

Lakshman Rajagopal, PhD<sup>1\*</sup>; Joel Reynolds, PhD<sup>2</sup>; Dawei Li<sup>1</sup>

<sup>1</sup>Department of Apparel, Events, and Hospitality Management, Iowa State University, Ames, IA, USA

<sup>2</sup>School of Hospitality Leadership, DePaul University, Chicago, IL, USA

### 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. 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 during inspections were identified as 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 practices in Chinese restaurants.

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

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### INTRODUCTION

Every year, contaminated food results in a number of illnesses and deaths in the United States. Annually, known disease-causing agents in food cause an estimated 9.4 million illnesses, 55,961 hospitalizations and 1,351 deaths. Furthermore, 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 2017, Americans spent approximately \$798.7 million purchasing food away from home (National Restaurant Association, 2017). Yet, approximately 56% of foodborne illness outbreaks are associated with restaurants or delicatessens-including cafeterias and hotels (Centers for Disease Control and Prevention [CDC], 2017).

Furthermore, an alarming majority (60%) of these reported foodborne illnesses have been linked to preventable errors in food handling by foodservice employees (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. It has been estimated that foodborne illnesses cost consumers \$51-78 billion in annual health-related costs (Scharff, 2012).

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 ethnic group in the U.S. from 2000-2015, increasing by 72% in 15 years. It was estimated that the Asian population will grow from 20.4 million in 2015 to 34.4 million by 2050 (Pew Research Center,

2017). This increase in diversity contributes to the increase in the number of 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 are a concern to food safety inspectors and consumers (Kwon, Roberts, Shanklin, Liu, & Yen, 2010).

Foodborne illness 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. While, 113 cases were associated 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 et al. 2014). Kwon, Choi, Liu, and Lee (2012) assessed the frequency and type of food code violations in 156 Asian restaurants finding the top violation categories were hand hygiene, time & temperature abuse, storing practices, physical facility maintenance, and food contact surface maintenance & ware washing facilities. Furthermore, nearly 3 critical violations occurred per inspection.

The U.S. Food and Drug Administration (FDA, 2013a) identified five major 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 major 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 each 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. However, 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 more depending on the type of establishment and food safety history of the establishment, as well as availability of food safety inspectors (Iowa Department of Inspections & Appeals,

\*Corresponding Author: Phone: (515) 294-9740; E-mail: Iraj@iastate.edu

2018). 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 et al. 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 that ethnic restaurants had more critical and non-critical violations, and more frequent food safety inspections than non-ethnic restaurants (Kwon, et. al, 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. It should be noted that each state categorizes critical and non-critical violations differently, however most follow the FDA Food Code guidelines. The FDA Food Code also calls “critical violations” “priority items” or “priority foundation items”. Priority items are defined as “items with a quantifiable measure to show control of hazards such as cooking, reheating, cooling, and handwashing” (FDA, 2019). Examples of these include: not enough refrigeration equipment, lack of proper hand hygiene or not cooking food to the appropriate internal temperature (FDA, 2019). A review of critical violations of all restaurants from 2008-2010 in Jefferson County, Alabama found that characteristics of restaurants such as type of cuisine were associated with frequency of certain critical violations (Menachemi, Yeager, Taylor, McClure, & Outmet, 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 *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 (Menachemi et al., 2012).

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 52,000 Chinese restaurants in the U.S., which is, perhaps twice the number of McDonald’s restaurants (National Restaurant Association, 2017). 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 to 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 restaurants in San Francisco; Satow, Inciardi, and Wallace (2009) found that sanitation levels in Chinese restaurants showed a wide degree of variability, with high and low sanitation standards, such as hand hygiene and food preparation issues.

Simonne, Nille, Evans, and Marshall (2004) suggested the increased incidence of foodborne illness originating from ethnic restaurants could be a result of food handler’s unfamiliarity with proper handling

practices of traditional ethnic ingredients (such as, chicken feet or fish heads), 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. 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 that courtesy, respect, and harmony were the top three Chinese cultural values (Liu, Kwon, Shanklin, Canter, & Webb, 2014).

Providing training and appropriate support (internal and external to the establishment) to Chinese restaurants is important. Though several studies have been conducted to identify food safety needs in Chinese restaurants from restaurant owners’ and employees’ perspective, little research has investigated the food safety inspector’s perspective. 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). In ethnic operations where limited training is provided by the operation, often the food safety inspector is one of the only forms of food safety education. This occurs when the inspector identifies an infraction and discussed the means to rectify or improve the food handling practice. Assessing the experiences of food safety inspectors when conducting food safety inspections in Chinese restaurants could assist in the development of appropriate approaches to educating Chinese-speaking foodservice workers about food safety. Which in turn, would potentially reduce the risk of a foodborne illness occurring in this type of operation due to improper food handling practices. The purpose of this study was to explore food safety inspectors’ perceptions of the food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants. The specific research objectives of the study were to:

1. Identify food safety violations that food safety inspectors have difficulty correcting in Chinese restaurants.
2. Detail food safety and sanitation practices in which Chinese restaurants need improvement.
3. Review cultural barriers food safety inspectors identify when conducting inspections in Chinese restaurants.

## METHODS

### Sample

Prior to the start of the study, IRB approval was obtained. A total of 45 Iowa Department of Inspections and Appeals (DIA) food safety inspectors with experience in conducting food safety inspections in independently-owned Chinese restaurants were contacted to participate in this study, of which 28 participated. 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.

### Research Instrument

The web-based questionnaire consisted of 13 open-ended questions 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. An open ended questionnaire was used to allow participants to describe their experiences and also simplify data analysis because the person responsible for data collection was a non-

native English speaker. 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 collecting data (Appendix 1).

### Data Collection

An invitation email containing the link to the questionnaire was sent to all participants (n = 45) listed in the mailing list provided by the DIA. Participants provided informed consent prior to participating in this study. Following recommendations by Dillman (2014), follow-up emails were sent at weeks one, two, and three to increase the response rate. Participants did not receive any incentive for their participation.

### Data Analysis

Descriptive statistics were computed for the demographic questions using Statistical Package for Social Sciences (SPSS) version 22. Responses to each of the open-ended questions were entered into MS EXCEL. Two researchers independently analyzed each participant's responses following the same protocol (Merriam, 2009). The protocol included: 1) exploring the data by reading through the response several times; 2) independently coding the data by segmenting and labeling the text; 3) verifying the codes through an inter-rater reliability agreement check; 4) using codes to develop categories by aggregating similar codes; 5) and assessing and combining similar categories to develop themes (Merriam, 2009).

## RESULTS AND DISCUSSION

### Profile of Participants

Forty-five food safety inspectors were invited to participate in this study, of which 28 completed the questionnaire, for a response rate of 62.2%. Almost equal numbers of males (n = 15, 53.6%) and females (n = 13, 46.4%) were represented (Table 1). The majority of participants (n = 25, 85.7%) were between the ages of 31-60 years and obtained a Bachelor's degree (60.7%) (see, Appendix 1). Participants had an average of 10 years of experience 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 Chinese restaurants per inspector. An increase in the number of Chinese restaurants in the United States (National Restaurant Association, 2017) is reflected in the number of restaurants inspected by food safety inspectors.

**Table 1. Demographic Profile of Food Safety Inspectors (n = 28)**

Characteristics	n	%
<b>Gender</b>		
Female	13	46.4
Male	15	53.6
<b>Age</b>		
21-30 years	1	3.6
31-40 years	9	32.1
41-50 years	8	28.6
51-60 years	7	25.0
More than 60 years	3	10.7
<b>Educational level</b>		
Associates	5	17.9
Bachelors	17	60.7
Masters	3	10.7
Doctoral	-	-
Other	3	10.7

### Food Safety in Independently-owned Chinese Restaurants

Table 2, presents themes and categories regarding food safety practices that food safety inspectors had difficulty correcting 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. However, inspectors 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.

Cold holding temperatures was 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) found, most restaurant managers (86%) reported having formal protocols for cooling of foods and 91% provided training to their employees about proper cooling. However, 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 major concern. If managers do not monitor use of proper cooling procedures, it is likely employees are not practicing safe food handling practices either. While, few food safety inspectors found that 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 that 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 getting Chinese restaurant managers to correct were identified as: cooling foods properly, date marking, preventing cross contamination, holding foods at correct temperatures, adequate pest control practices, sanitizing food contact surfaces, hand hygiene practices (wearing gloves, avoiding bare hand contact, washing hands frequently when handling different foods), monitoring of employee health, proper storage of raw meat, and proper use of three-compartment sinks. Non-critical violations food safety inspectors had difficulty in getting Chinese restaurant managers to correct were identified as: 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, and thermometers usage. This is consistent with previous research (Kwon et al. 2010).

Food safety and sanitation issues that could be improved upon were identified as: general cleanliness of facility, staff food safety knowledge, holding food at correct temperatures, preventing cross contamination, and adequate sanitizing. Kwon et al. (2010) found that 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 as a major issue (FDA, 2006; Walczak, 2000). Menachemi et al. (2012), also found that ethnic restaurants to have similar food safety and sanitation issues.

### Cultural Issues and Cultural Barriers Identified During Inspections

Table 3 shows, in response to questions regarding cultural issues food safety inspectors faced when conducting food safety inspections in

**Table 2. Themes/categories Inspectors have Difficulty Correcting (n = 28)**

Themes	Categories	n	%	
Food safety practices in compliance*	Cooking foods to appropriate internal temperature	14	50.0	
	Proper holding temperature	4	14.3	
	Date marking of foods	3	10.7	
	Awareness of the importance of employee health	2	7.1	
	Purchasing foods from approved source	2	7.1	
	Proper dish washing procedures	2	7.1	
	Food safety concerns*	Improper cooling of foods	10	35.7
Food safety concerns*	Improper cold holding temperature	9	32.1	
	Lack of proper pest management,	6	21.4	
	Improper dishwashing procedures	6	21.4	
	Date marking	5	17.9	
	Critical violations*	Improper cooling of foods	9	32.1
	Inadequate date marking of foods	9	32.1	
	Cross contamination	5	17.9	
	Improper holding temperature	5	17.9	
	Improper sanitizing	4	14.3	
	Poor pest control	4	14.3	
Critical violations*	Unclean food contact surfaces	3	10.7	
	General unsafe food handling practices	2	7.1	
	Poor employee health	2	7.1	
	Improper storage of raw meat	1	3.6	
	Improper or lack of use of three-compartment sink for sanitizing	1	3.6	
	Non-critical violations	Unclean non-food contact surfaces	16	57.1
	Improper utensil storage	1	3.6	
	Inadequate or lack of labeling of foods	1	3.6	
	Lack of testing sanitizer concentrations	1	3.6	
	Leaving food uncovered during storage	1	3.6	
	Lack of food thermometer use	1	3.6	

\* Inspectors identified more than 1 category within Theme

independently-owned Chinese restaurants; approximately 50% of participants identified that language barriers (n = 14) and cultural differences (n = 14) as challenges. Also identified were communication problems; lack of knowledge of the Food Code; time and financial constraints for food safety inspectors to train and educate foodservice workers. These findings are consistent with previous research on cultural barriers and ethnic restaurants (Simonne et al. 2004). Some food safety inspectors indicated that 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. Other participants stated, 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), and hid themselves or their poor food handling practices from the food safety inspector. Inspectors also described how foodservice employees 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 that trust (believing others actions are in interest of one's betterment), reciprocity (responding to positive actions of others with positive actions which help continuing and building relationships), face (maintaining dignity or prestige in society), time (importance of using time efficiently in tasks that are perceived as important), harmony (maintaining peaceful relationships with those around), hierarchy (a

system where ranked above others based on status and/or authority), power distance (the extent to which less powerful members of an organization accept and expect that power is distributed unequally), and long-term orientation (willingness to forsake short-term success or materials to prepare for the future) to influence Chinese business practices (Fan, 2000; Kuo-Shu, 1987; Matthews, 2000; Rokeach, 1973). Mock and DeFranco (1999) found that Chinese workers preferred resolution of issues in an "implicit and mild" manner which could explain why food safety inspectors perceived Chinese restaurant workers were hiding themselves or their food handling practices from inspectors; 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 that 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. For example, the training material could assist to educate regarding appropriate cultural norms in the United States versus in the Chinese culture.

#### CONCLUSIONS AND APPLICATIONS

The purpose of this study was to explore food safety inspectors' perceptions of the food safety needs of Chinese-speaking foodservice workers in independently-owned Chinese restaurants. A web-based questionnaire was utilized in this exploratory study. Results of this

**Table 3. Cultural Issues and Barriers Identified during Food Safety Inspections (n = 28)**

Themes	Categories
Cultural Issues*	<p>Language barriers  <i>"Language is a huge issue, if someone is not there who speaks English I have a hard time communicating."</i></p> <p>Conservativeness of Chinese culture  <i>"I feel that, as a woman, the male owners do not take what I say as requirements"</i></p> <p>Low risk perception  <i>"Risk perception varies on leaving food at ambient temperature. Example leaving previously cooked meat and egg rolls out of refrigeration for extended periods of time and not time marking and discarding"</i></p> <p>Frugality  <i>"Sometimes, I see reuse of a shopping bag as a food storage bag"</i></p> <p>Hiding the truth about actual food handling practices or themselves from food safety inspectors  <i>"A particular facility had numerous critical violations during an inspection (hot water turned off, cross contamination, cold hold temps above required temperature, dish machine out, sanitizer out, bleach sanitizer in an orange juice bottle, etc). Items were fixed when I was there. I came back to do a re-check 2 weeks later and many of the violations were the same as when I was there before"</i></p> <p>Gaining trust and respect of Chinese restaurant workers  <i>".... say to me....all Chinese restaurants are like this....you are too picky"</i></p>
Challenges or barriers*	<p>Language barriers  <i>"Language barrier, failure to understand the seriousness of violations....sometimes unless I can produce a dead person....they will not believe me"</i></p> <p>Cultural differences  <i>"Chinese restaurants do not understand the risk level of certain food safety issues, because it was not seen as an issue in their country"</i></p> <p>Communication problems  <i>"They speak only enough English to take customers' orders, etc. No understanding of English language beyond that"</i></p> <p>Lack of knowledge about the Food Code  <i>... "not maintaining compliance with code-say we've worked through a violation and it has been corrected, but then you go back for a recheck and they have reverted to non-compliance again"</i></p> <p>Time constraints during inspections to explain food safety issues, financial constraints  <i>" ....there isn't enough time to explain in detail all the impacts of poor food handling practices...."</i></p>

\* Inspectors identified more than 1 category within theme

study showed food safety violations which food safety inspectors have difficulty correcting in Chinese restaurants. Additionally, findings identified food safety and sanitation practices in which Chinese restaurants need improvement. This study identified that 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.

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 perceptions of food safety inspectors. Results could aid food safety educators when developing educational tools to tailor 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.

To improve food safety knowledge, attitudes, and practices of Chinese-speaking foodservice workers food safety inspectors suggested foodservice workers complete a food safety course and/or obtain a food safety certification. Inspectors also recommended providing training and training materials to restaurant managers and food handlers in the Chinese language, such as videos, posters, and picture cards with food safety information in Chinese. The inspectors

recommended training be conducted by a trained instructor as well as on-going on-the-job maintenance training be conducted by the restaurant manager. An additional resources could be to provide a Chinese training handbook which can serve as a one-stop resource for food safety information, and the 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. These suggested visual aids are an inexpensive educational tool and have been shown to be effective in other foodservice settings (Reynolds & Rajagopal, 2017).

Rajagopal (2012, 2013) found that 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. As access to training materials is often scarce due to limited funds and time, and further compounded due to limited understanding of proper food safety practices by managers (Rudder, 2006), the food safety inspector is often the most valuable intervention tool.

It is important that in addition to food safety training and conducting food safety inspections, food safety inspectors should also consider

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 the Chinese culture. Educators can also consider the role of food safety culture (Arendt & Sneed, 2008; Griffith et al., 2010; Powell et al., 2011; Reynolds & Rajagopal, 2017; 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.

There are several limitations to this study. First, this study was conducted in one state and results may not be generalized to other parts of the U.S. or other types of ethnic restaurants, as each culture is unique. Additionally, advanced statistical analysis was not possible, though future research with a larger sample could assist with this. 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 the use of visual-based training. Future research could explore the effectiveness of visual-based training on attitudes, knowledge, and practices of Chinese-speaking foodservice workers. Furthermore, additional research should be conducted to assess food inspector’s perspectives on other ethnic restaurants to provide a different perspective. Finally, future research should investigate longitudinal effects of food inspector’s food safety education interventions on restaurant food inspections. However, this study is the first known study that provided an opportunity to explore food safety inspectors’ perceptions of food safety practices in independently-owned Chinese restaurants.

## REFERENCES

Abidin, U. F. U. Z., Arendt, S. W., & Strohbehn, C. H. (2013). Exploring the culture of food safety: The role of organizational influencers in motivating employees’ safe food handling practices. *Journal of Quality Assurance in Hospitality & Tourism, 14*, 321-343. doi:10.1080/1528008X.2013.802587

Arendt, S. W., & Sneed, J. (2008). Employee motivators for following food safety practices: pivotal role of supervision. *Food Protection Trends, 28* (10), 708-711. Retrieved from <http://www.foodprotection.org/files/food-protection-trends/Sep-Oct-15-arendt.pdf>

Brown, L. G., Ripley, D., Blade, H., Reimann, D., Everstine, K., Nicholas, D., ... & Quilliam, D. N. (2012). Restaurant food cooling practices. *Journal of Food Protection, 75*(12), 2172-2178. doi:10.4315/0362-028X.JFP-12-256

Centers for Disease Control and Prevention (CDC). (2017). *Foodborne Diseases Active Surveillance Network (FoodNet): FoodNet 2015 Surveillance Report (Final Data)*. Atlanta, Georgia: U.S. Department of Health and Human Services, CDC. Retrieved from <https://www.cdc.gov/foodnet/reports/annual-reports-2015.html>

Fan, Y. (2000). A classification of Chinese culture. *Cross Cultural Management: An International Journal, 7*(2), 3-10. doi:<http://dx.doi.org/10.1108/13527600010797057>

Griffith, C. J., Livesey, K. M., & Clayton, D. A. (2010). Food safety culture: the evolution of an emerging risk factor? *British Food Journal, 112*, 426-438. doi:10.1108/00070701011034439

Iowa Department of Inspections & Appeals (2018). *Food Safety – Regulatory Authority*. Retrieved from <https://dia.iowa.gov/food-and-consumer-safety-bureau>

Kwon, J., Choi, Y. G., Liu, P., & Lee, Y. M. (2012). Food safety training needed for Asian restaurants: Longitudinal review of health inspection data in Kansas. *Journal of Foodservice Management and Education, 6*, 10-15.

Kwon, J., Roberts, K. R., Shanklin, C. W., Liu, P., & Yen, W. S. (2010). Food safety training needs assessment for independent ethnic restaurants: review of health inspection data in Kansas. *Food Protection Trends, 30*(7), 412-421. Retrieved from <http://www.foodprotection.org/files/food-protection-trends/Jul-10-Kwon.pdf>

Kuo-Shu, Y. (1987). Chinese values and the search for culture-free dimensions of culture. *International Journal of Psychology, 18*, 143-164. Retrieved from <http://140.112.114.62/handle/246246/103651>

Lee, J. H., Hwang, J., & Mustapha, A. (2014). Popular ethnic foods in the United States: A historical and safety perspective. *Comprehensive Reviews in Food Science and Food Safety, 13*(1), 2-17. doi:10.1111/1541-4337.12044

Lee, L. E., Niode, O., Simonne, A. H., & Bruhn, C. M. (2012). Consumer perceptions on food safety in Asian and Mexican restaurants. *Food Control, 26*(2), 531-538. doi:10.1016/j.foodcont.2012.02.010

Linsk, R., & Sitaramiah, G. (2000). Just how safe is dining out? Five-part series. *Pioneer Planet, 22*–26.

Liu, P., & Kwon, J. (2013). The exploration of effects of Chinese Cultural Values on the attitudes and behaviors of Chinese restaurateurs toward food safety training. *Journal of Environmental Health, 75*(10), 38. doi:10.1108/09596110910955703

Liu, P., Kwon, J., Shanklin, C. W., Canter, D. D., & Webb, F. J. (2014). Food safety training attitudes and reported behaviors of Chinese restaurateurs in the United States. *Food Protection Trends, 34*, 300-311. Retrieved from <http://www.foodprotection.org/files/food-protection-trends/Sep-Oct-14-Liu.pdf>

Liu, Y., & Jang, S. S. (2009). Perceptions of Chinese restaurants in the US: What affects customer satisfaction and behavioral intentions?. *International Journal of Hospitality Management, 28*, 338-348. doi:10.1016/j.ijhm.2008.10.008

Matthews, B. M. (2000). The Chinese value survey: An interpretation of value scales and consideration of some preliminary results. *International Journal of Education, 1*, 117–126. Retrieved from <http://dspace2.flinders.edu.au/xmlui/bitstream/handle/2328/3137/MATTHEWS.pdf?sequence=1>

Menachemi, N., Yeager, V. A., Taylor, D. M., Braden, B., McClure, L. A., & Ouimet, C. (2012). Characteristics of restaurants associated with critical food safety violations. *Food Protection Trends, 32*(2), 73-80. Retrieved from <http://www.foodprotection.org/files/food-protection-trends/Feb-12-Menachemi.pdf>

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco: Jossey-Bass.

Mintel. (2014). *Ethnic foods-US-January 2014, report brochure*. Retrieved from: <http://oxygen.mintel.com/display/679964/#>

Mok, C., & DeFranco, A. L. (1999). Chinese cultural values: Their implications for travel and tourism marketing. *Journal of Travel and Tourism Marketing, 8*, 99–114. doi:10.1300/J073v08n02\_07

National Restaurant Association. (2017). *Restaurant industry-pocket factbook*. Retrieved from: [https://www.restaurant.org/Downloads/PDFs/News-Research/Pocket\\_Factbook\\_FEB\\_2017-FINAL.pdf](https://www.restaurant.org/Downloads/PDFs/News-Research/Pocket_Factbook_FEB_2017-FINAL.pdf)

Newbold, K. B., McKeary, M., Hart, R., & Hall, R. (2008). Restaurant inspection frequency and food safety compliance. *Journal of Environmental Health, 71*(4), 56. Retrieved from <http://search.proquest.com/openview/e241a26bfa1d905c20bc5e4469ac1daa/1?pq-origsite=gscholar>

Pew Research Center (2017). *Key facts about Asian Americans, a diverse and growing population*. Retrieve from <http://www.pewresearch.org/fact-tank/2017/09/08/key-facts-about-asian-americans/>

Pham, M. T., Jones, A. Q., Sargeant, J. M., Marshall, B. J., & Dewey, C. E. (2010). A qualitative exploration of the perceptions and information needs of public health inspectors responsible for food safety. *BMC Public Health, 10*, 345-354. doi:10.1186/1471-2458-10-345

- Po, L. G., Bourguin, L. G., Occeea, L. G., & Po, E. C. (2011, June/July). Food safety education for ethnic audiences. *Food Safety Magazine*. Retrieved from <http://www.foodsafetymagazine.com/article.asp?id=4119&sub=sub1>
- Powell, D. A., Jacob, C. J., & Chapman, B. J. (2011). Enhancing food safety culture to reduce rates of foodborne illness. *Food Control*, 22(6), 817-822. doi:10.1016/j.foodcont.2010.12.009
- Rajagopal, L. (2012). Use of visuals for food safety education of Spanish-speaking foodservice workers: A case study in Iowa. *Journal of Extension*, 50(2). Available at: <http://www.joe.org/joe/2012april/rb6.php>
- Rajagopal, L. (2013). Educating immigrant Hispanic foodservice workers about food safety using visual-based training. *Journal of Extension*, 51(2). Available at <http://www.joe.org/joe/2013april/a8.php>
- Reynolds, J., & Rajagopal, L. (2017). Investigating food safety culture factors that influence child care employees' safe food handling practices. *The Journal of Foodservice Management & Education*, 11(2), 7-16.
- Roberts, K. R., Barrett, B. B., Howells, A. D., Shanklin, C. W., Pilling, V. K., & Brannon, L. A. (2008). Food safety training and foodservice employees' knowledge and behavior. *Food Protection Trends*, 28(4), 252-260. Retrieved from <https://krex.k-state.edu/dspace/bitstream/handle/2097/806/RobertsFPTApr2008.pdf?sequence=1>
- Roberts, K., Kwon, J., Shanklin, C., Liu, P., & Yen, W. S. (2011). Food safety practices lacking in independent ethnic restaurants. *Journal of Culinary Science & Technology*, 9(1), 1-16. doi:10.1080/15428052.2011.549041
- Rokeach, J. (1973). *The nature of human values*. The Free Press, New York, NY
- Rudder, A. (2006). Food safety and the risk assessment of ethnic minority food retail businesses. *Food control*, 17(3), 189-196. doi:10.1016/j.foodcont.2004.10.017
- Satow, Y. E., Inciardi, J. F., & Wallace, S. P. (2009). Factors used by restaurant customers to predict sanitation levels. *Journal of Foodservice Business Research*, 12, 170-179. doi:10.1080/15378020902910785
- Scallan, E., Griffin, P. M., Angulo, F. J., Tauxe, R. V., & Hoekstra, R. M. (2011a). Foodborne illness acquired in the United States - unspecified agents. *Emerging Infectious Diseases*, 17, 16-22. doi:10.3201/eid1701.P21101
- Scallan, E., Hoekstra, R. M., Angulo, F. J., Tauxe, R. V., Widdowson, M.-A., Roy, S. L., & Griffin, P. M. (2011b). Foodborne illness acquired in the United States—major pathogens. *Emerging Infectious Diseases*, 17, 7-15. doi:10.3201/eid1701.P11101
- Scharff, R. L. (2012). Economic burden from health losses due to foodborne illness in the United States. *Journal of Food Protection*, 75, 123-131. doi:<http://dx.doi.org/10.4315/0362-028X.JFP-11-058>
- Simonne, A. H., Nille, A., Evans, K., & Marshall, M. R. (2004). Ethnic food safety trends in the United States based on CDC foodborne illness data. *Food Protection Trends*, 24, 590-604. [http://www.researchgate.net/profile/Amarat\\_Simonne/publication/235900696\\_Ethnic\\_food\\_safety\\_trends\\_in\\_the\\_United\\_States\\_based\\_on\\_CDC\\_foodborne\\_illness\\_data/links/0deec516ee4bd0b9e6000000.pdf](http://www.researchgate.net/profile/Amarat_Simonne/publication/235900696_Ethnic_food_safety_trends_in_the_United_States_based_on_CDC_foodborne_illness_data/links/0deec516ee4bd0b9e6000000.pdf)
- Strohbehn, C., Sneed, J., Paez, P., & Meyer, J. (2008). Hand washing frequencies and procedures used in retail food services. *Journal of Food Protection*, 71(8), 1641-1650. doi:10.4315/0362-028X-71.8.1641
- U.S. Food and Drug Administration (FDA) (2009). *Food Code 2009*. Retrieved from: <http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/ucm2019396.htm>
- U.S. Food and Drug Administration (FDA) (2013a). *Foodborne illnesses: What you need to know*. Retrieved from: <http://www.fda.gov/food/foodborneillnesscontaminants/foodborneillnessesneedtoknow/default.htm>
- U.S. Food and Drug Administration (FDA) (2013b). *Food code 2013*. Retrieved from: <http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/ucm374275.htm>
- U.S. Food and Drug Administration (FDA) (2015). *FDA Oral Culture Learner Project training materials*. Retrieved from: <http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/IndustryandRegulatoryAssistanceandTrainingResources/ucm212661.htm>
- U.S. Food and Drug Administration (FDA) (2019). *Food Code 2017*. Retrieved from: <https://www.fda.gov/downloads/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/UCM595140.pdf>
- Walczak, D. (2000). Overcoming barriers to restaurant food safety. *Hospitality Review*, 18(2), 89-97. Retrieved from <http://digitalcommons.fiu.edu/hospitalityreview/vol18/iss2/8/>
- Yiannas, F. (2008). *Food safety culture: Creating a behavior-based food safety management system*. Springer Science & Business Media. doi:10.1007/978-0-387-72867-4
- York, V. K., Brannon, L. A., Shanklin, C. W., Roberts, K. R., Howells, A. D., & Barrett, E. B. (2009). Foodservice employees benefit from interventions targeting barriers to food safety. *Journal of the American Dietetic Association*, 109, 1576-1581. doi:10.1016/j.jada.2009.06.370
- Zablotsky Kufel, J. S., Resnick, B. A., Fox, M. A., McGready, J., Yager, J. P., & Burke, T. A. (2011). The Impact of Local Environmental Health Capacity on Foodborne Illness Morbidity in Maryland. *American Journal of Public Health*, 101(8), 1495-1500. doi:10.2105/AJPH.2011.300137 doi:10.2105/AJPH.2011.300137

## Appendix 1. Questionnaire for Food Safety Inspectors

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!*