

## **Food and Safety Training Needed for Asian Restaurants: Longitudinal Review of Health Inspection Data in Kansas**

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### **ABSTRACT**

*The purpose of this study was to assess the frequencies and types of food code violations at Asian restaurants in Kansas using longitudinal review of health inspection data. A total of 326 restaurant inspection reports from 156 Asian restaurants in 10 Kansas counties were reviewed. Descriptive and inferential statistics were calculated using SPSS. The findings of this study suggested the focus areas for food safety training in Asian restaurants: temperature control of PHF; employee personal hygiene; and employee hand washing practices. Also, our results indicated that behavior-related violations, especially behavior-related critical violations occurred more during the routine health inspection than other inspection types. In the future, researches could identify the effective ways to overcome barriers to food safety training in Asian restaurants. Through this investigation, Asian restaurant owners and managers may gain insights on what food handling practices related to code violations they should emphasize when training their employees.*

**Keywords:** *Kansas Department of Agriculture (KDA), foodborne illness, Asian restaurant, food safety training, health inspection, food code violation*

### **INTRODUCTION**

According to a report from the U.S. Centers for Disease Control and Prevention (CDC, 2009), total foodborne outbreaks associated with ethnic foods increased from 3% in 1990 to 11%

in 2000. CDC estimates 76 million cases of foodborne illnesses occur each year in the U.S. responsible for 5,000 deaths and hospitalization each year (Mead et al., 1999). Restaurants have been implicated as one of the most frequent settings for foodborne illness outbreaks (Knight, Worosz, & Todd, 2007). Because foods prepared at restaurants are also served to many customers, the scale of foodborne outbreaks caused by restaurants is much greater than those caused by home-cooked meals (CDC, 2007). The majority of the ethnic foodborne outbreaks happened by Mexican, Italian and Asian foods (Simonne, Nille, Evans, & Marshall Jr., 2004).

A few studies have been carried out to explore food handling practices in ethnic restaurants. Mauer et al. (2006) found that many food safety professionals considered that ethnic restaurants did not have adequate food safety information. Food safety experts perceived that the top three practices that violated by most ethnic restaurants were improper food temperature, cross contamination, and poor worker hygiene. Kwon, Roberts, Shanklin, Liu, and Yen, (2009b) found that ethnic restaurants violated more food code, both critical and non-critical, than non-ethnic restaurants. These studies addressed the need for food safety training programs that focus on the critical behaviors as they could likely lead to foodborne outbreaks in these restaurants.

Ram, Sanghera, Abbas, and Barlow (2000) reported that only 26% independent restaurants operated by ethnic minority received food safety and personal hygiene training. These researchers reported that the employers were doubtful about the necessity of training, unless it was required by law. Rudder (2006) found that the restaurant owners felt the lack of food safety resources and support being barriers to adopting food safety guidelines. Additional barriers that prevent the foodservice establishments from providing food safety training for their employees were a lack of resources, time constraints, attitudes of the employees and language barrier (Mauer et al., 2006; Roberts, Barrett, Howells, Shanklin, Piling, & Brannon, 2008).

Restaurant inspection is one way to ensure the food hygiene and safety practices in the restaurants are followed (Binkley, Nelson, & Almanza, 2008). Seiver and Hatfield (2002) contended that a restaurant disclosure system could benefit the society as it raises awareness among the public regarding the food safety risks and motivates foodservice managers and employees to be more compliant with the regulations. However, individual inspection records may not portray the persistent challenges that may exist in their establishments.

Therefore, this study was conducted to examine multiple health inspection data of Asian independent restaurants in Kansas over a 12-month period (i.e., January 1 to December 31, 2009) to identify if there were persistent food-handling challenges and to investigate the food safety training needs for Asian restaurant employees. Specific objectives were to identify the frequencies and types of food code violations using longitudinal review of health inspection data for Asian ethnic restaurants in Kansas. Kansas Department of Agriculture (KDA) publishes the restaurant health inspection reports online with specific code violations indicated. Through this investigation, ethnic restaurant owners and managers may gain insights on what food handling practices related to code violations they should emphasize when training their employees. At the same time, health department employees may use this information to address continual challenges as they observe during Asian restaurant inspections.

## LITERATURE REVIEW

### Asian restaurants in America

After Chinese food was introduced to the U.S. in the mid-19<sup>th</sup> century, Asian foods such as Chinese, Vietnamese, Japanese, and Thai cuisines gradually became an indispensable part of American daily life (The Foodtimeline, 2010). The American population is becoming more diverse, appropriate to be called cultural melting pot. According to a report from U.S. Census (2008), the minority population accounted for approximately 44% of the U.S. population in 2008 and will continue increasing to 62% by 2050. With the growing ethnic population, the awareness and demand of ethnic food is also increasing. According to U.S. Census Bureau, Asian and Hispanic business owners are the two largest ethnic minority groups that operate restaurants in the U.S. (U.S. Census Bureau, 2006a, 2006b). More specifically, Chinese food is considered as one of the America's favorite ethnic foods and accounts for a large part in ethnic restaurants in America. According to Chinese Restaurant News (2007), the total number of Chinese restaurants is twice as many as McDonald's restaurants in the U.S.

### Foodborne illness outbreak in America & consumer perception of Chinese restaurants

Most foodborne outbreaks caused by ethnic food were associated with Mexican, Italian and Asian foods (Simonne, Nille, Evans, & Marshall M. R., 2004). Liu and Jang (2008) found that environmental cleanliness in Chinese restaurants was related to customers' revisit intention and needed to improve. Kwon, Roberts, Shanklin, Liu, and Yen (2009a) also identified Asian and Mexican or Latin American ethnic restaurants had significantly more critical violations and number of inspections than non-ethnic restaurants. Unlike home cooked meals where consumers are ultimately responsible for food handling and preparation, consumers must place their trust in chefs and other foodservice employees to insure that the foods they eat are handled and prepared properly when eating at restaurants (Knight et al., 2007). Ethnic restaurants are not immune from the risk of foodborne diseases. The CDC also reported that total foodborne outbreaks related to ethnic foods between 1990 and 2000 raised from 3% up to 11%, the majority of the outbreak happened from ethnic foods (Simonne, Nille, Evans, & Marshall Jr., 2004). In 2008, Liu and Jang have identified top five attributes that affect customers' consumption intention to dine in Chinese restaurants, and they were taste, food safety, food freshness, environmental cleanliness, and appropriate food temperature. Among those attributes, food safety was rated as the most important followed by environmental cleanliness. MORI survey for Kimberley-Clark Professional from food hygiene perceptions report 2004–Key lessons from International research (2004) found that even though customers are satisfied with the food quality and price, 84% of customers would not revisit the restaurant if they thought it was not clean.

### Food safety training

The food safety professionals identified the high variety of menus and unfamiliarity with the food items as potential reasons why they failed to promote proper food handling among the food handlers in the ethnic restaurants. Rudder (2006) found that there was an increased risk of contamination with *E. coli* O157 or *Clostridium botulinum* because the business owners did not understand how they should store their food and other packing materials. Failure to control the

hot food temperature (70%) and lack of proper cooling (18%) were rampant among food retail businesses run by the ethnic minority which further increased the microorganism contamination. The restaurant industry consisted of many small-size, self-operated, and independent businesses that may have additional challenges to train their employees compared with large chain restaurants.

Restaurant inspection is one of the methods used by many states in the U.S. to ensure the food hygiene and safety practices in the restaurants are up to the standard (Binkley, Nelson, & Almanza, 2008). The results of the restaurant inspections are reported using letter grades, numerical scores, colored cards, and smiley faces (Filion, 2009). It helps the foodservice managers and employees to be more compliant with the Food Code. Irwin, Ballard, and Grendon (1989) concluded that the restaurant inspections scores could be used to predict the occurrence of foodborne illness as the inspection scores of restaurants with more reported outbreak cases were significantly lower than those with no reported outbreak cases.

Even though there are many merits of evaluating food handling with the restaurant inspection scores, it was also criticized that the isolated inspection scores do not necessarily reflect the food handling practices in restaurants. It has been stated that the restaurant inspections records only capture the “snapshot” of restaurant operation and do not reflect appropriateness of food handling in day-to-day operation. Frequent inspections have shown mixed results in term of their relationship with sanitation compliances (Bader, Blonder, Henriksen, & Strong, 1978; Corber, Barton, Nair, & Dulberg, 1984; Kaplan, 1978; Kwon et al., 2009b; Mathias, Sizto, Hazlewood, & Cocksedge, 1995; Newbold, 2008). Kwon et al. (2009b) contends that the frequency of inspection itself indicates increased need for food safety training as the increased number of inspections was due to complaints and follow-up visits. Reviewing longitudinal data of food inspection reports may reveal persistent challenges in food handling in these restaurants.

## **MATERIALS AND METHODS**

### **Study sample and instrument**

There are 4,671 commercial foodservice establishments in Kansas (NRA, 2009b). Approximately 3,600 of those establishments are located in 14 counties where the population density of ethnic minority population is the greatest. Of 3,600, over 500 establishments were identified as ethnic restaurants and 219 independently-own Asian restaurants. All 219 Asian restaurant in 10 Kansas counties where the highest numbers of Asian population were selected as the study sample, but inspection reports were available only for 156 restaurants. The instrument developed by Kwon et al. (2009a) was used to collect data from multiple inspection reports. Since the data is considered public records and no human subjects were involved in the research protocol, no approval from the institutional review board was necessary.

### **Variables and data collection**

Once the sample was selected, health inspection reports of each establishment were reviewed on Kansas Department of Agriculture (KDA) website (<http://www.ksda.gov/winwam>).

Each Kansas Food Code violations were recorded from every inspection report available (KDA, 2005). All 326 health inspection reports of 156 Asian restaurants in the sample were reviewed and recorded during March and April 2010. After the initial data collection, the data were cross-checked for accuracy of the data entry. The individual codes violations in each restaurant were recorded on the data collection form along with the number and types (e.g., routine inspection, complaint-driven inspection, follow-up inspection after poor performance on previous inspection, etc.) of health inspection reports in the 12-month period (January 1 – December 31, 2009), the number of critical and non-critical food code violations, and frequency of individual code violations of each report were recorded on the data collection instrument. Data were then entered into a Microsoft Access database, cross-checked again to verify correct data entry, and converted to SPSS for Windows, Version 15.0 for data analyses.

### **Statistical data analyses**

Prior to statistical analyses, individual food codes were grouped based on categories identified by KDA. KDA categories were further combined to reduce the number of variables. The “Compute” function of SPSS was used to add all violations within each category. To evaluate persistent violations and food handling challenges, multiple inspection records for the same establishments were combined using Microsoft Excel before statistical analysis. Further, to make the meaningful comparisons, the total number of violations per category from all restaurant inspection reports was divided by the number of inspections per establishment to calculate the average violations per restaurant inspection. Descriptive statistics were calculated to summarize the data including frequencies, cross-tabulations, means, and standard deviations of continuous variables (i.e., number of inspections, critical & non-critical violations, and violations in each category). Paired-samples t-tests were conducted to determine if the differences exist in numbers of critical, non-critical and within-category violations between routine or other types of initial inspections and subsequent follow-up inspections. Analysis of Variance (ANOVA) with Tukey’s post hoc analyses were conducted to evaluate differences in numbers of individual and categorical code violations between and among inspection types (i.e., routine inspection, complaint-driven inspection and follow-up inspection). Statistical significance was determined at  $p < 0.05$ .

## **RESULTS**

A total of 326 restaurant inspection reports were reviewed from 156 Asian restaurants in 10 Kansas counties. Food handling practices that were categorized as behavior-related included hand washing occasions and methods; glove use; cooking, holding, cooling, and reheating procedures; eating, drinking, and smoking in kitchen. Non-behavior-related violations demonstration of knowledge; temperature of cold storage; adequacy of hand washing facilities and supplies. The average number of critical and non-critical violations for these restaurants was  $2.92 \pm 2.59$  and  $2.05 \pm 2.55$ , respectively. Among them, an average of  $2.66 \pm 2.41$  violations were behavior-related and  $2.30 \pm 2.77$  were non-behavior related. Of behavior violations,  $1.89 \pm 1.75$  violations were considered critical. The average number of inspections during the 12-month study period (January 1- December 12, 2009) was  $4.10 \pm 25.72$  (ranged from 1 to 9)

**Table 1. Mean number of violations per inspection (N=326)**

| <b>Variables<sup>a</sup></b>    | <b>Mean number <math>\pm</math> SD</b> |
|---------------------------------|--|
| Critical Violations             | 2.92 $\pm$ 2.59                        |
| Non-critical Violations         | 2.05 $\pm$ 2.55                        |
| Behavior-related Violations     | 2.66 $\pm$ 2.41                        |
| Non-behavior-related Violations | 2.30 $\pm$ 2.77                        |
| Critical-behavioral Violations  | 1.89 $\pm$ 1.75                        |

<sup>a</sup>Number of violations found in one health inspection report between January 1, 2009 to December 31, 2009

### **Prevalence of individual food code violations and descriptive statistics for compiled inspections**

Based on paired t-tests, the categories were ranked from most violated food code category to the least identifying training priority. ‘Time and Temperature Control of Potentially Hazardous Food’ and ‘Protection from Contamination’ and ‘Control of Hands as a Vehicle of Contamination’ were violated the most followed by ‘Physical Facility Maintenance (e.g., hot & cold water availability, toilet, sewage & waste water, garbage & refuse disposal)’, ‘Food & Non-Food Contact Surface Maintenance & Ware Washing Facilities’, and ‘Contamination Prevention through Pest Control, Storage, & Personal Cleanliness Safe Cooling, Thawing, Hot Holding Methods & Working Thermometer’.

The number of food code violations was computed for each restaurant. The five most violated categories within the restaurant were “*Control of Hands as a Vehicle of Contamination*” (2.09  $\pm$  1.71), “*Safe Cooling, Thawing, Hot Holding Methods & Working Thermometer*” (1.56  $\pm$  1.41), “*Contamination Prevention through Pest Control, Storage, & Personal Cleanliness*” (1.55  $\pm$  1.82), “*Physical Facility Maintenance*” (1.39  $\pm$  2.28), and “*Food & Non-Food Contact Surface Maintenance & Ware Washing Facilities*” (1.04  $\pm$  1.56).

The number of food code violations per category was computed by taking all violations within each category divided by the total number of inspections (Table 2). The five most violated categories per inspection report were “*Safe Cooling, Thawing, Hot Holding Methods & Working Thermometer*” (0.73  $\pm$  0.68), “*Contamination Prevention through Pest Control, Storage, & Personal Cleanliness*” (0.73  $\pm$  0.69), “*Control Hands as a Vehicle of Contamination*” (0.65  $\pm$  0.78), “*Physical Facility Maintenance*” (0.57  $\pm$  0.68), and “*Food & Non-Food Contact Surface Maintenance & Ware Washing Facilities*” (0.46  $\pm$  0.55). Compared to “*Physical Facility Maintenance*”, which includes 78 codes, “*Safe Cooling, Thawing, Hot Holding Methods & Working Thermometer*” with only 7 food codes have less chance to be violated. However, our results show that “*Safe Cooling, Thawing, Hot Holding Methods & Working Thermometer*” was one of the most violated food code categories per inspection record. Therefore, “*Safe Cooling, Thawing, Hot Holding Methods & Working Thermometer*” may be the area more attention should be given than other food handling behaviors for Asian restaurants.

**Table 2. Mean number of the top five violation categories observed in Asian restaurants in Kansas: Descriptive Statistics by types of violations per inspection**

| Descriptions   | No. of food code per category | Mean <sup>a</sup> ± SD |
|--|-------------------------------|------------------------|
| Safe Cooling, Thawing, Hot Holding Methods & Working Thermometer   | 7                             | .73 ± .68              |
| Contamination Prevention through Pest Control, Storage, & Personal Cleanliness   | 14                            | .73 ± .69              |
| Control of Hands as a Vehicle of Contamination   | 14                            | .65 ± .78              |
| Physical Facility Maintenance (e.g., hot & cold water availability, toilet, sewage & waste water, garbage & refuse disposal) | 78                            | .57 ± .68              |
| Food & Non-Food Contact Surface Maintenance & Ware Washing Facilities  | 48                            | .46 ± .55              |

<sup>a</sup> Mean score calculated by dividing the number of per Violation in certain group by number of restaurants (n=156)

An analysis of variance (ANOVA) with Tukey's post hoc analyses test was used to compare numbers of violations and types of inspections. The results indicated that the difference was significant ( $F= 3.85, p < 0.001$ ) between routine ( $4.40 \pm 0.34$ ) and other regulatory ( $2.50 \pm 0.56$ ), as well as complaint ( $4.52 \pm 0.67$ ) and other regulatory ( $2.50 \pm 0.56$ ). Critical violations also showed a significant difference between inspection types ( $F= 5.78, p < 0.001$ ). The differences were noted between routine ( $2.31 \pm 0.18$ ) and other regulatory ( $1.36 \pm 0.34$ ), routine ( $2.31 \pm 0.18$ ) and modified complaint ( $2.41 \pm 0.57$ ), complaint ( $2.61 \pm 0.38$ ) and other regulatory ( $1.36 \pm 0.34$ ), complaint ( $2.61 \pm 0.38$ ) and modified complaint ( $2.41 \pm 0.57$ ). Non-critical violations did not show any significant difference between inspection types. Behavior-related violations showed a significant difference between inspection types ( $F= 5.22, p < 0.001$ ). The pair of inspection types that showed the significant differences were routine ( $2.31 \pm 0.18$ ) vs. other regulatory ( $1.16 \pm 0.26$ ) and complaint ( $2.13 \pm 0.31$ ) vs. other regulatory ( $1.16 \pm 0.26$ ). Non behavioral-related violations were not significantly different between inspection types.

Critical, behavior-related violations showed a significant difference among inspection types ( $F= 18.56, p < 0.001$ ) which occurred between routine ( $1.65 \pm 0.13$ ) vs. other regulatory ( $0.76 \pm 0.17$ ) and routine ( $1.65 \pm 0.13$ ) and modified complaint ( $1.23 \pm 0.29$ ). Critical, non-behavior related violations did not show any significant difference between inspection types. There were no significant differences between routine and follow up in critical, non-critical, behavior-related, and non-behavior-related violations. That is, follow up didn't necessary improve the practices of food safety in the Asian restaurants.

## DISCUSSION

Results from this study, which utilized publicly-available health inspection reports to identify specific food safety training needs associated with Asian restaurants, revealed evidence

of food safety training needs in independent Asian restaurants. In Kansas, each foodservice establishment receives at least one unannounced inspection each year. If the results of the routine inspection show poor performance in the establishment, follow-up re-inspection will be warranted. Therefore, the frequency of inspections in the 12-month period indirectly indicates potential food handling problems in a foodservice establishment. Data indicated that routine inspections were performed at least once a year and number of inspected varied depended on how frequently additional inspections were needed.

Researchers found that increasing the frequency routine inspections did not motivate restaurateurs to perform better. Jones et al. (2004) did not find any associations between inspection scores and the frequency of restaurant inspection. Corber et al. (1984) also concluded that in general, increasing the number of inspections from 6 to 12 in a year did not enhance the sanitation level of the restaurants. On the contrary, other studies showed that high risk restaurants transformed themselves into low risk restaurants after receiving inspections every one to two months (Briley and Klaus, 1985). In case of Kansas, an increased number of inspections were not due to efforts to improve food handling practices. Rather the increased number of inspections were due to additional inspections were needed due to poor performance or customer complaints. Future study may be recommended to investigate why restaurants fail to perform better despite being inspected for multiple times and reports being given.

According to Kwon et al. (2009b), the type of more prevalent food code violations could lead to foodborne illnesses in restaurants. Fail to control time and temperature, poor personal hygiene, and cross-contamination have been identified as the most significant contributors to foodborne illnesses (FDA, 2004). Phillips, Elledge, Basara, Lynch, & Boatright (2006) analyzed the recurrent of food code violations in Oklahoma from 1996-2000 showed that the highest number of repeated violations reported by Oklahoma State Department of Health (OSDH) (Oklahoma FoodService Establishment Inspection, n.d.) and Oklahoma City-County Health Department (OCCHD) (Oklahoma FoodService Establishment Inspection, n.d.) were maintaining correct food holding temperature, pest control, and personal hygiene. Our findings showed that controlling time and temperature during cooling, thawing, and hot holding and use of a thermometer to monitor food temperatures were the most frequently violated practices in Asian restaurants. The results of this study showed consistency in this challenge of time and temperature control for Asian restaurants.

Rudder (2006) performed a risk assessment to investigate the reasons behind failure to comply with food safety standard at food retail businesses owned by ethnic minority groups. One of the reasons for such a challenge was physical structures of the premises which were not properly maintained. Cultural traditions of food preparation handed down through generations may be also a contributor for poor food safety handling in specific ethnic groups (Kwon, 2008). The other challenges found in ethnic restaurants were proper stock rotation, storage method, hot and cold holding temperatures, and cooling methods (Rudder, 2006). Rudder also reported that there were communication barriers between inspection officers and the foodservice workers including difficulty in understanding language used food safety in reports. They were also often unaware of what was required by law. Employees in this segment of food business also did not have adequate knowledge about hygiene practices despite training have been given. Employees did not transform what they learned into real practices. Another indication where the language



barriers may be a problem in ethnic restaurants was the fact that ethnic restaurants had more violations in demonstrated knowledge in the inspection report (Kwon et al., 2009b). Future research may also investigate employees' attitudes towards food safety training and barriers to food safety training in Asian and other ethnic restaurants; and how employees can apply their food safety knowledge to their behaviors effectively.

## CONCLUSION AND MANAGERIAL IMPLICATION

One result of this study showed that "*Safe Cooling, Thawing, Hot Holding Methods & Working Thermometer*" was one of the most violated food code categories per inspection record among the five most violated categories per inspection report, including "*Safe Cooling, Thawing, Hot Holding Methods & Working Thermometer*", "*Contamination Prevention through Pest Control, Storage, & Personal Cleanliness*", "*Control Hands as a Vehicle of Contamination*", "*Physical Facility Maintenance*", and "*Food & Non-Food Contact Surface Maintenance & Ware Washing Facilities*". Therefore, Asian restaurants may need to pay more attention on these five areas than other food handling behaviors when training employees. In essence, the most important categories that operators should concentrate on is time and temperature control of PHF, employee personal hygiene and employee hand washing practices.

Detailed inspection reports available online enabled researchers to identify specific violations and training needs for Asian independent restaurants in Kansas. Our results show that behavior-related violations, especially critical violations occurred more in the routine health inspections than other inspection types. Poor food handling behaviors could be a major cause of the number of foodborne outbreaks related to ethnic foods (Simonne, 2004). Therefore, the findings of this study suggest the focus areas for food safety training in Asian restaurants should be time and temperature control of PHF, employee personal hygiene and employee hand washing practices. Poor food handling in restaurants is much more serious problem than at home, since the larger number of individuals could be infected by foodborne illness outbreaks.

Future research may be needed to identify the effective ways to overcome barriers to food safety training in Asian restaurants, especially those related to behavior-related critical violations. In order to increase Asian restaurant owners' awareness of the need for food safety training, both tangible and intangible risks associated with foodborne illness outbreaks in the establishments may be addressed in food safety training (Kwon, 2009b). Moreover, it will be critical to examine the roles of training status and Asian restaurant owner's attitude toward food safety on the frequencies of health code violations. The findings of this study are limited to Asian independent restaurants located in 10 counties in Kansas. Therefore, the results cannot be generalized to other geographic locations or other types of restaurants (i.e., corporate, non-ethnic, or other ethnic restaurants).

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