



Consumer perceptions on food safety in Asian and Mexican restaurants

Louise E. Lee^a, Omar Niode^a, Amarat H. Simonne^{b,1}, Christine M. Bruhn^{a,*}

^a Center for Consumer Research, Department of Food Science and Technology, University of California Davis, One Shields Avenue, Davis, CA 95616-8598, USA

^b Department of Family, Youth and Community Sciences, University of Florida, 3025 McCarty Hall, P.O. Box 110310, Gainesville, FL 32611-0310, USA

ARTICLE INFO

Article history:

Received 24 August 2011
Received in revised form
31 January 2012
Accepted 7 February 2012

Keywords:

Ethnic
Asian
Mexican
Restaurant
Foodborne illness
Consumer
Attitude

ABSTRACT

Dining out is a frequent activity for most Americans. Ethnic-food restaurants like Chinese and Mexican are the most sought after dining experience after American cuisine. The Centers for Disease Control and Prevention (CDC) foodborne outbreak data from 1990 to 2000 shows an increase of foodborne outbreaks from ethnic restaurants. Focus groups and an online survey were conducted to explore consumer perceptions of restaurant food safety and attitudes toward ethnic restaurants. Twenty-seven Californians participated in focus groups and volunteers ($n = 994$) in both California and Florida completed an internet survey. While respondents noted that they only dine at restaurants where they trust the food, Mexican restaurants scored higher in food safety confidence than Asian restaurants. Kitchen cleanliness was the most important factor influencing safety followed by restroom cleanliness and cooking temperature. People believed all restaurant employees should be trained in food safety, restaurant inspections should be more frequent, and the government should be more active in protecting consumers. Food safety is an underlying factor in restaurant selection and continued patronage. Women and seniors scored higher on seriousness of food safety adherence in restaurants while young males respondents reported to worry less about food safety when dining out. Word of mouth and the internet were the most frequently cited sources of food safety information. While respondents believed they are knowledgeable about food safety, they often failed to recognize signs of foodborne illness. Incorporating information about consumer attitudes into food safety training courses could help ethnic restaurant owners be mindful of their customers' expectations.

© 2012 Elsevier Ltd. All rights reserved.

1. Introduction

Americans dine out often; 44% of adults say restaurants are an essential part of their lifestyle (National Restaurant Association, 2010). American cuisine is regularly chosen when eating out, followed closely by the “Big Three” ethnic restaurants, Chinese, Italian, and Mexican (American Express MarketBrief, 2007; Hensley & Bohm, 2000; Mintel Oxygen Reports, 2009; Sloan, 2010). While growth in Asian and Hispanic populations (Ortman & Guarneri, 2009) will increase demand for these cuisines, Caucasians, with a buying power of \$9125 billion, are the driving force for ethnic cuisine in the United States (Ahmed, 2004; Humphreys, 2009; Roberts, 2008).

From 1998 through 2002, 50% of the reported outbreaks were linked to restaurant or delicatessen dining (Centers for Disease Control and Prevention, 2006). From 1990 to 2000 foodborne

outbreaks in ethnic restaurants rose from 3% to 11% (Simonne, Nille, Evans, & Marshall, 2004). Ethnic restaurants tend to score lower during inspections (Hedberg et al., 2006; Jones, Pavlin, LaFleur, Ingram, & Schaffner, 2004; Kwon, Roberts, Shanklin, Liu, & Yen, 2010) and are more likely to be associated with foodborne outbreak than non ethnic restaurants (Buchholz, Run, Kool, Fielding, & Mascola, 2002; Franco & Simonne, 2009; Hedberg et al., 2006; Irwin, Ballard, Grendon, & Kobayashi, 1989; Rudder, 2006; Simonne et al., 2004). Management and workers in ethnic restaurant have prior cultural understanding and knowledge of food preparation (Ungku Fatimah, Boo, Sambasivan, & Salleh, 2011) that differs from food safety recommendations, thus making adherence to guidelines challenging.

While food hygiene can be a key factor in deciding where to dine (Ungku Fatimah et al., 2011; Worsfold, 2006a), most people do not think of food safety when choosing a place to eat (Aksoydan, 2007; Leach, 2003). Customers who do consider safety often use aesthetics, visible cues, and restroom cleanliness to reflect the kitchen environment (Aksoydan, 2007; Barber & Scarcelli, 2009; Worsfold, 2006a). For what they cannot see, health inspectors' reports, specifically posted green, yellow, and red colors or A, B, C

* Corresponding author. Tel.: +1 530 752 2774; fax: +1 530 752 4759.

E-mail addresses: asim@ufl.edu (A.H. Simonne), cmbruhn@ucdavis.edu (C.M. Bruhn).

¹ Tel.: +1 352 273 3536; fax: +1 352 392 8196.

letter grades, can remind customers about the potential risk prior to entering the restaurant. Posted inspection results provides a sense of trust to the customers and creates a positive feedback loop through increased business revenues (Editorial, 2002; Hume, 2003).

The objective of this research is to document consumer attitudes toward food safety in restaurant, specifically Asian and Mexican restaurants.

2. Materials and methods

2.1. Focus groups

Three focus groups of ethnic restaurant patrons were conducted in California to gain insights on consumer perception and concerns for ethnic-food safety, and illicit suggestions as to how ethnic-food safety practices could be improved. Questions were designed to explore consumer awareness of food safety issues, their concerns for dining in ethnic-food establishments, their opinions on current food safety practices in restaurants, and suggestions on how to improve food safety practices. Research procedures were approved by the University of California Davis (UCD) Institutional Review Board.

Volunteers patronizing ethnic restaurants were recruited by the UCD Cooperative Extension Office in Yolo County, California by posting flyers in the county administration office and mailing announcements to volunteer groups. Focus groups lasted one hour and followed the procedures detailed by Krueger (1994).

2.2. Internet survey

Questions addressing attitudes toward food safety, the desire for restaurant safety and sources of information were pilot tested with the target audience and modified as needed before finalization. Worldwide Panel, a private company, supplied a contact list and authorized the survey which was hosted by the University of Florida. The survey was available through the internet in October 2007 to volunteers 18 years or older living in five counties in Florida (Alachua, Duval, Hillsborough, Orange, and Miami Dade) and California (Fresno, Orange, San Diego, Shasta, and Yolo). Respondents were given a monetary compensation for their time. All procedures were approved by the human subject protocols office at the University of Florida.

The five part survey was completed in order. The first section addressed general food safety concerns when eating out and documented volunteers' dining out frequency. If respondents dined at Asian or Mexican establishments, they completed the next part of the survey which focused specifically on that cuisine. Asian was defined as Chinese, Japanese, and Thai cuisines. All volunteers completed the third part of the survey, which addressed consumer knowledge of restaurant regulation, sources of food safety information, and interest in learning about food safety. Respondents were asked if they had ever been sick from a food related illness and if they ever experienced symptoms of diarrhea, nausea, or vomiting. The survey concluded with demographic questions. Most of the responses are measured on a five-point Likert scale with 1 being "not serious" or "strongly disagree" to 5 being "very serious" or "strongly agree". Other questions simply required a "yes", "no", or an open ended response. The survey took approximately 20 min to complete.

Findings were analyzed using chi-square, ANOVA (SAS Version 9.1 and 9.2) and post hoc Tukey's HSD test. Values with a $p < 0.05$ were considered statistically significant. Demographic characteristics were grouped for analysis. Age range was categorized into young adults (18–39), middle aged adults (40–69), and seniors (70 years and older). Income was also separated into three groups: high

income (\$70,000 and over), medium income (\$40,000–\$69,999), and low income (\$39,999 and lower). Levels of education were divided into three groups of high, medium, and low. High education included those who completed a four year college or advanced degree. Medium education represented the people who have a two year associates degree or a technical degree. Those with a high school diploma or those who did not graduate from high school were classified as low education. Ethnicity was categorized as Asians, Hispanics, Non-Hispanic Whites (NHW) and Other, which included African American, Native American, and those who identified themselves in none of these categories.

3. Results

3.1. Focus groups

Three consumer focus groups were conducted, with a total of 27 participants. Of the total, five were males (two Asians, three NHW), and 22 were females (two Asians, 20 NHW).

3.1.1. Criteria for choosing ethnic restaurants

Participants noted the importance of facility cleanliness, such as floors, tables, and bathrooms, as a criterion for choosing ethnic restaurants.

Typical comments by the participants included:

When we go to places we're unfamiliar with... I usually go to the back and look at the floor (of the kitchen)...I also look at the bathrooms.

Bathrooms, tables, and if I have access to see the kitchen, I'll always look into the kitchen.

Participants also noted that they would use the restaurant grade cards as a determinant of whether it is safe to eat at a particular establishment.

Typical comments by the participants included:

If it's not an "A" I don't go in there.

I have a habit of looking at the health department rating.

3.1.2. Indicators for safe foods

When asked what indicators participants would use to determine whether a food is safe to eat, a number of them mentioned temperature.

Typical comments by the participants included:

Temperature...particularly the buffet... you can tell if they're making sure that these things aren't left out too long.

3.1.3. Unsafe practices

When asked whether participants have noticed unsafe-handling practices in the restaurants, such as uncooked/undercooked meats, or dirty utensils, many were able to recall such instances. However, a number of participants said that they would excuse mistakes if handled in a professional manner. One woman commented on the need for more effective communication with ethnic-food vendors:

My daughter does food inspections, when she goes to ethnic restaurants...and when she points out violations, they dumb down their English...so there was a language barrier that she had a problem with.

3.1.4. Food safety enforcement: inspections

Many believed the government is not strict enough in enforcing food safety practices due to lack of personnel.

Typical comments by the participants included:

...like any other policing kind of service or agency, they have the potential to do what they need to do, but they don't do it because there's not enough staff, or the person doing it isn't doing it well...I think the reality is they're not checking it as often as they should be. But one issue with that is you're going to have to raise taxes to have more staffing.

Furthermore, one woman suggested the use of surprise inspections:

I think it would be nice if they [inspectors] show up unexpected instead of letting them [restaurants] know because if they just clean up when they know inspections are coming, then the rest of the time they will slack off.

3.1.5. Food safety education

When asked whether the requirement of having one person with food safety certification in the restaurant is adequate, many believed one person would not be enough to ensure food safety.

Typical comments by the participants included:

Why only one? That person can't be there all the time; a lot of restaurants are beyond a full work day.

I think you need to have certified, aside from owner or manager, a kitchen staff so that there can be more people to supervise the general manhandling or cooking of foods that can ensure that temperatures are correct, and cleaning, prepping, etc.

3.2. Internet survey

A total of 994 completed the survey with approximately 50% of respondents from each state. The majority of respondents were female (71%, $N = 705$), Non-Hispanic White (66%, $N = 657$), and an average age of 43 years. Respondents under 40 made up 45%, those reported to be 40–59 were 40% and the rest were 60 and older. Of the total, 11% ($N = 113$) of participants identified themselves as Hispanic, and 9% ($N = 90$) identified themselves as Asians. Nearly half of respondents were married (47%, $N = 471$) and those who were never married were the second largest group (26%, $N = 260$). In terms of education, 15% of respondents have completed high school or less, 47% have some kind of associates degree or some post high school training, and 39% completed a four year college or beyond. Slightly more than half are employed by a company, business, or government (52%, $N = 517$). Reported income ranged from under \$9999 to \$90,000 or more, with the largest 18% ($N = 180$) in the latter income bracket.

Marital status between those who are single and married showed no significance difference in any of the questions.

3.2.1. Frequency of dining out and most preferred cuisine

Most respondents dined out 10 times per month, with a range from 0 to 20 times per month. American cuisine was chosen most frequently (75%, $N = 747$), followed closely by Chinese (73%, $N = 729$), then Mexican (71%, $N = 708$) (Fig. 1). Restaurants offering other Asian cuisines were also frequently visited; 25% ($N = 248$) of respondents ate Japanese when going out, and 16% ($N = 155$) chose Thai cuisine.

3.2.2. Dining out food safety opinions

When asked to evaluate several factors that could impact safety, kitchen cleanliness, a mean of 4.44, was rated significantly higher than other factors by all demographic groups (Table 1). Next in importance were cooking and preparing food, quality and freshness, state inspections, cleanliness of restrooms, food storage, and temperature of storage areas. Whether the food was certifiably

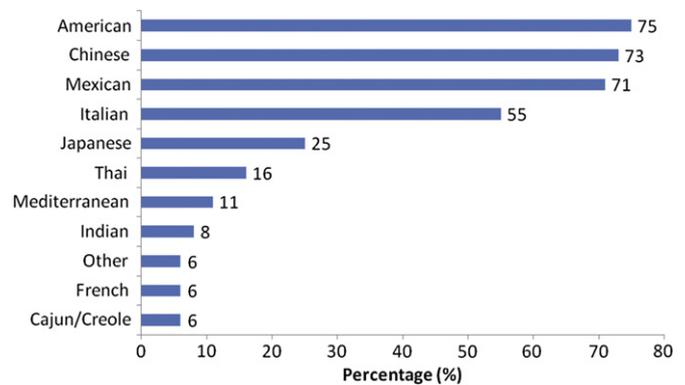


Fig. 1. Frequency of most preferred cuisines when dining out, $N = 994$.

organic was rated significantly lower than all other factors with a mean of 2.92. On average, females rated most factors significantly higher than men. Asians rated the temperature of food storage and preparation lower than the NHW, but rated organic food higher. Young adults rated the storage area, temperature of storage, and temperature of prepared food significantly lower than both middle aged adults and seniors.

3.2.3. Perceptions of ethnic-food choices

All respondents generally believed the quality of food is above average at the Mexican and Asian restaurant where they dine most frequently, as well as ethnic restaurants in general. Mexican restaurants received a small but significantly higher quality rating than Asian restaurants, 3.90 compared to 3.83, and ethnic restaurants in general, 3.81 [not shown]. Concern about food safety in ethnic restaurants, was moderate, mean score of 2.86 out of 4 [not shown].

3.2.4. Opinions about Asian restaurants

Respondents overwhelmingly agreed that they only dine at Asian restaurants where they trust the quality of the food, with a mean score of 3.89 (Table 2). Next in importance were ingredient content and authenticity. The lowest score was generated from the statement about not thinking about food safety when dining out, possibly suggesting that safety is a consideration. Females and males showed significant differences for all the factors, except the authenticity of ingredients and attention to ingredients used in Asian cooking. Compared to their counterparts, young adults, males, high and medium educated respondents, and those with high income expressed greater agreement with trying new Asian restaurants. High and medium educated respondents also pay more attention to contents or ingredients used in Asian dishes than those with low education. Young adults, Asians, and males tended to not think about food safety issues when eating out at Asian restaurants. Asians, males, and those with medium or high education levels did not see themselves at risk for food related illness.

3.2.5. Opinions about Mexican restaurants

As with Asian restaurants, survey respondents most strongly agreed with eating at Mexican restaurants where they trust the quality of the food, followed by ingredient content and authenticity (Table 3). Lowest agreement was expressed for the statement about not considering food safety when they eat out at Mexican restaurants, again possibly suggesting that safety is a basic expectation. There was no significant difference within genders and ethnicities. However, similar to Asian restaurants, young adults and respondents with medium or high education levels had a higher likelihood to try new Mexican restaurants. These three demographic groups

Table 1
Dining out food safety opinions.

	Mean	Gender		Ethnicity				Age ^a		
		Female	Male	Asian	Hispanic	NHW	Other	Young adult	Middle aged adult	Senior
The cleanliness of the kitchen	4.44 ^A	4.53 ^A	4.22	4.20	4.45	4.48	4.39	4.37	4.46	4.57
Cooking and preparing of food	4.32 ^B	4.39 ^A	4.17	4.20	4.40	4.33	4.33	4.27	4.34	4.45
Quality of food (freshness, ingredients, etc.)	4.32 ^{BC}	4.37 ^A	4.18	4.18	4.27	4.32	4.43	4.25	4.34	4.49
State approval/ inspection	4.32 ^{BC}	4.42 ^A	4.06	4.11	4.40	4.34	4.29	4.26	4.34	4.41
The cleanliness of the restrooms	4.28 ^{BC}	4.39 ^A	4.03	4.16	4.35	4.28	4.33	4.24	4.30	4.41
Storage of food	4.27 ^{BC}	4.32 ^A	4.15	4.07	4.29	4.31	4.22	4.16	4.35 ^A	4.36 ^A
Temperature of storage areas of food	4.27 ^{BC}	4.34 ^A	4.10	3.98 ^A	4.19 ^{AB}	4.32 ^B	4.26 ^{AB}	4.15	4.33 ^A	4.45 ^A
Temperature that food is prepared	4.22 ^C	4.28 ^A	4.08	3.98 ^A	4.05 ^{AB}	4.29 ^B	4.21 ^{AB}	4.10	4.29 ^A	4.36 ^A
Serving of food	3.98 ^D	4.02	3.90	3.89	4.02	3.96	4.10	3.92 ^A	3.96 ^A	4.30
The days between the purchase and preparation of the food	3.98 ^D	4.03 ^A	3.84	3.90	4.04	3.98	3.99	3.92	4.00	4.07
The ingredients within the food	3.97 ^D	4.04 ^A	3.81	3.93	4.01	3.98	3.96	4.01	3.92	4.05
Where the food originated from before cooking	3.49 ^E	3.52	3.42	3.59	3.56	3.46	3.52	3.46	3.50	3.60
If the food was certifiably organic	2.92 ^F	2.92	2.92	3.32 ^A	3.08 ^{AB}	2.79 ^B	3.13 ^A	2.94	2.88	2.97

Scores were on a 5-point Likert scale from 1 = "not at all serious", 3 = "average", 5 = "very serious".

Superscript letters indicates significant values at $p < 0.05$.

NHW: non-Hispanic White $N = 994$.

^a $N = 993$.

are also less likely to think about food safety when eating at a Mexican restaurant. Respondents with medium and high education were less likely than lower education levels to see themselves at risk for food related illness when eating Mexican foods.

3.2.6. Restaurant regulations

Respondents strongly agreed that all restaurant employees should go through food safety training before being allowed to open, with a mean score of 4.59, inspections should be more frequent, and restaurant employees should communicate to the public about ingredients used (Table 4). Significantly lower agreement was expressed for the statement that the government is doing a good job in training. Women showed significantly greater concern for safety than men and were more likely to want information on food ingredients. Compared to other ethnic groups, Asians were less likely to believe that all restaurant employees should go

through training, and they were more likely to believe that the government was doing a good job. Compared to young adults, seniors are more likely to agree that ethnic restaurant employees should communicate about ingredients used and increase incidence of inspections. Those with less formal education were more likely to support frequent inspections than those with high education.

3.2.7. Food safety awareness, responsibility, and interest

Respondents expressed significantly higher interest in food safety information than awareness of how to access information. People also strongly supported the concept that all citizens should be involved in food safety (Table 5). Women rated all factors significantly higher than men. Those with lower education background expressed greater interest in food safety information compared to those with more formal education. Compared to other

Table 2
Perceptions of respondents on Asian restaurants.

	Mean	Gender		Ethnicity				Age ^a			Education			Income		
		Female	Male	Asian	Hispanic	NHW	Other	Young adult	Middle aged adult	Senior	Low	Medium	High	Low	Medium	High
I only eat at Asian restaurants that I trust the quality of their food	3.89 ^A	3.95 ^A	3.75	3.73	3.86	3.94	3.83	3.84	3.95	3.79	3.79	3.89	3.94	3.80	3.91	3.95
I pay attention to the contents/ ingredients used in Asian foods	3.66 ^B	3.68	3.61	3.68	3.67	3.62	3.80	3.62	3.71	3.59	3.37	3.66 ^A	3.77 ^A	3.60	3.68	3.71
The authenticity of the recipes and meals served are important to me	3.63 ^B	3.64	3.61	3.85	3.73	3.57	3.66	3.62	3.63	3.68	3.53	3.61	3.70	3.62	3.61	3.66
I do not see myself at risk for food related illness when eating Asian foods	3.23 ^C	3.17 ^A	3.37	3.53	3.19 ^A	3.19 ^A	3.20 ^A	3.30 ^A	3.16	3.27 ^A	2.78	3.23 ^A	3.41 ^A	3.29	3.19	3.21
I try to go to Asian restaurants that I have never been to before	3.02 ^D	2.92 ^A	3.26	3.56	2.96 ^A	2.99 ^A	2.81 ^A	3.22	2.90 ^A	2.83 ^A	2.54	3.02 ^A	3.20 ^A	2.89 ^A	2.97 ^A	3.21
I do not think about food safety when I eat out at Asian restaurants	2.61 ^E	2.53 ^A	2.80	3.31 ^A	2.46 ^A	2.58 ^A	2.34 ^A	2.77 ^A	2.47 ^B	2.59 ^{AB}	2.15 ^A	2.58 ^B	2.81 ^C	2.71	2.46	2.65

Scores were on a 5-point Likert scale from 1 = "strongly disagree", 3 = "neutral", 5 = "strongly agree".

Superscript letters indicates significant values at $p < 0.05$.

NHW: non-Hispanic White.

$N = 994$.

^a $N = 993$.

Table 3
Perceptions of respondents on Mexican restaurants.

	Mean	Gender		Ethnicity				Age ^a			Education			Income		
		Female	Male	Asian	Hispanic	NHW	Other	Young adult	Middle aged adult	Senior	Low	Medium	High	Low	Medium	High
I only eat at Mexican restaurants that I trust the quality of their food	3.93 ^A	3.95	3.87	4.05	3.89	3.92	3.96	3.84 ^A	4.02 ^B	3.92 ^{AB}	3.83	3.95	3.94	3.80 ^A	3.99 ^B	3.98 ^{AB}
The authenticity of the recipes and meals served are important to me	3.80 ^{AB}	3.82	3.77	3.82	4.00	3.77	3.78	3.77	3.84	3.77	3.76	3.81	3.80	3.77	3.72	3.90
I pay attention to the contents/ ingredients used in Mexican foods	3.74 ^B	3.78	3.63	3.77	3.75	3.72	3.85	3.71	3.77	3.72	3.57	3.77	3.76	3.77	3.74	3.73
I do not see myself at risk for food related illness when eating Mexican foods	3.31 ^C	3.29	3.33	3.61	3.39	3.27	3.28	3.34 ^{AB}	3.25 ^A	3.43 ^B	2.86	3.39 ^A	3.36 ^A	3.44	3.23	3.27
I try to go to Mexican restaurants that I have never been to before	3.24 ^C	3.21	3.33	3.59	3.39	3.21	3.13	3.41	3.13 ^A	3.00 ^A	2.90	3.26 ^A	3.34 ^A	3.20 ^{AB}	3.12 ^A	3.41 ^B
I do not think about food safety when I eat out at Mexican restaurants	2.81 ^D	2.78	2.86	3.05	2.89	2.80	2.57	2.91 ^A	2.76 ^{AB}	2.50 ^B	2.44	2.84 ^A	2.90 ^A	2.85	2.71	2.86

Scores were on a 5-point Likert scale from 1 = “strongly disagree”, 3 = “neutral”, 5 = “strongly agree”. Superscript letters indicates significant values at $p < 0.05$. NHW: non-Hispanic White. N = 994. ^a N = 993.

ethnicities, Asians had the lowest ratings in all factors. Hispanics rated significantly lower than NHW and Other in terms of self-assessment of food safety knowledge. Young adults significantly showed lower interest in all factors than their counterparts.

3.2.8. Where and how often respondents obtain food safety information

Friends and word of mouth followed by the internet were the most often used sources of food safety information (Fig. 2). Public television and newspaper or magazines were also cited as frequent information sources. Least used resources are presentations or lectures by experts and county cooperative extension agents.

3.2.9. Respondent awareness of foodborne illness

Less than half of the respondents believed they have not been affected by foodborne illness, but a majority acknowledged that they have experienced diarrhea, nausea, or vomiting (Table 6).

Those who said they had foodborne illness believed it only occurred on average three times although some acknowledged that illness has occurred as often as 20 times [not shown]. Asians, Hispanics, and young adults were the only demographics that reported high incidences of experiencing foodborne related illness. Significantly fewer Asians reported encountering symptoms of diarrhea, nausea, or vomiting than any other demographic group (44%).

4. Discussion

Selection of ethnic cuisines by this sample mirrors that reported nationwide (American Express MarketBrief, 2007; Hensley & Bohm, 2000; Mintel Oxygen Reports, 2009; Sloan, 2010). Even though both Mexican and Asian food are popular in the United States, respondents tended to trust Mexican restaurants more than Asian restaurants, while incidence of illnesses due to Mexican foods were much higher than that of Asian foods from 1990 to 2000

Table 4
Respondents’ beliefs regarding restaurant regulations.

	Mean	Gender		Ethnicity				Age ^a			Education			Income		
		Female	Male	Asian	Hispanic	NHW	Other	Young adult	Middle aged adult	Senior	Low	Medium	High	Low	Medium	High
All restaurant employees should go through food safety training before begin allowed to open	4.59 ^A	4.66 ^A	4.40	4.23	4.57 ^A	4.65 ^A	4.52 ^A	4.48 ^A	4.71	4.48 ^A	4.61 ^{AB}	4.64 ^A	4.51 ^B	4.57	4.60	4.59
Inspections should be more frequent	4.23 ^B	4.29 ^A	4.07	4.06	4.34	4.21	4.30	4.14 ^A	4.24 ^{AB}	4.44 ^B	4.37 ^A	4.24 ^{AB}	4.16 ^B	4.23	4.28	4.17
Ethnic restaurant employees should communicate to the public more about what ingredients they use in their foods	3.99 ^C	4.03	3.91	3.79	4.07	4.01	3.99	3.93 ^A	4.00 ^{AB}	4.16 ^B	3.99	4.03	3.95	4.01	4.05	3.92
The government is already doing a good job at training restaurant employees about food safety	2.96 ^D	2.92 ^A	3.08	3.50 ^A	3.25 ^{AB}	2.83 ^C	3.00 ^{BC}	3.12 ^A	2.78	3.13 ^A	2.92	2.94	3.00	3.02	2.89	2.98

Scores were on a 5-point Likert scale from 1 = “strongly disagree”, 3 = “neutral”, 5 = “strongly agree”. Superscript letters indicates significant values at $p < 0.05$. NHW: non-Hispanic White. N = 994. ^a N = 993.

Table 5
Food safety awareness, responsibility, and interest.

	Mean	Gender		Ethnicity				Age ^a			Education			Income		
		Female	Male	Asian	Hispanic	NHW	Other	Young adult	Middle aged adult	Senior	Low	Medium	High	Low	Medium	High
Interest in food safety information	3.96 ^A	4.02 ^A	3.82	3.66 ^A	3.96 ^B	3.95 ^B	4.20 ^C	3.78	4.10 ^A	4.10 ^A	4.08 ^A	3.97 ^{AB}	3.91 ^B	3.94	3.97	3.97
Citizen involvement in food safety	3.84 ^B	3.91 ^A	3.69	3.58 ^A	3.78 ^{AB}	3.85 ^B	4.07 ^C	3.67	3.99 ^A	3.96 ^A	3.86	3.87	3.82	3.82	3.85	3.88
Self-assessment of food safety knowledge	3.70 ^C	3.81 ^A	3.44	3.07 ^A	3.31 ^A	3.81 ^B	3.90 ^B	3.39	3.95 ^A	3.82 ^A	3.73	3.72	3.66	3.63	3.78	3.69
Personal responsibility of food safety	3.51 ^D	3.59 ^A	3.33	2.99 ^A	3.48 ^B	3.52 ^B	3.87 ^C	3.19	3.78 ^A	3.65 ^A	3.52 ^{AB}	3.60 ^A	3.40 ^B	3.50	3.60	3.44
Awareness of food safety information	3.36 ^E	3.40 ^A	3.27	3.09 ^A	3.29 ^{AB}	3.40 ^B	3.45 ^B	3.20 ^A	3.50 ^B	3.42 ^{AB}	3.28	3.39	3.36	3.35	3.42	3.33

Scores were on a 5-point Likert scale from 1 = “strongly disagree”, 3 = “neutral”, 5 = “strongly agree”.

Superscript letters indicates significant values at $p < 0.05$.

NHW: non-Hispanic White.

$N = 994$.

^a $N = 993$.

(Simonne et al., 2004). The confidence may stem from similarities shared between American and Mexican cuisine staples, such as use of meat, tomato, cheese, and grain (Powitz, 2009). In contrast, Asian cuisine may include foreign ingredients such as shark fin, unfamiliar vegetables and other novel ingredients (Mauer et al., 2006). Furthermore, Asian food establishments tend to score lower and have higher rates of violation than other restaurants (Hedberg et al., 2006; Jones et al., 2004; Kwon et al., 2010). The widespread low scores can create a sense of warning for customers which results in less trust.

Although this survey included only respondents from California and Florida, food safety concerns and information sources are consistent with those reported nationally (Altekruse, Street, Fein, & Levy, 1996; Altekruse, Yang, Timbo, & Angulo, 1999; Byrd-Bredbenner, Maurer, Wheatley, Cottone, & Clancy, 2007; Food Marketing Institute, 2009; Knight et al., 2008; Meer & Misner, 2000; Redmond & Griffith, 2004). Restaurant patrons' seeked high quality ethnic restaurants that use authentic ingredients. The belief that ethnic restaurants should communicate more about ingredients used in their dishes may reflect concern about use of flavor enhancers or unusual ingredients (Sukalakamala & Boyce, 2007). While food safety was not a dominant concern, safe preparation was a basic expectation. People do not feel at risk when dining out, perhaps due to optimistic-bias and previous experience that did not lead to illness (Weinstein & Klein, 1996).

Respondents overwhelmingly agreed that inspections should be more frequent. Inspections provides assurance to the public even

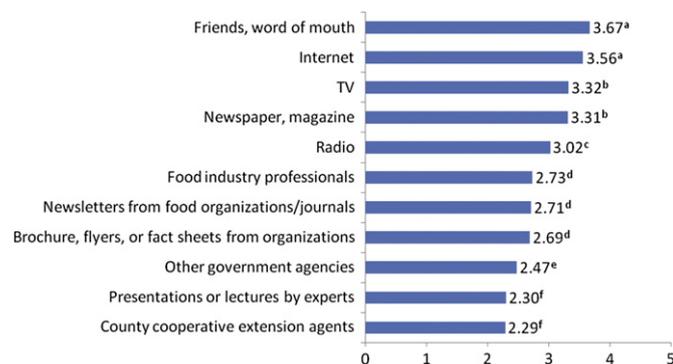


Fig. 2. Averages ratings of food safety information sources likely used by consumers, $N = 994$. The closer the value is to 5, the more likely the respondents used the source. Scores were on a 5-point Likert scale from 1 = “never”, 3 = “sometimes”, 5 = “always”.

though few people know how health inspections work (Jones & Grimm, 2008; Niode, 2008; Worsfold, 2006b). Although people would like more inspections, others have found that they may not be willing to pay more for the increased service (Brewer & Rojas, 2008). Future research should address consumer expectations as to an appropriate inspection schedule coupled with projected costs.

While a majority of respondents reported that they have not had foodborne illness, they acknowledged experiencing diarrhea, vomiting, and nausea. This contradiction suggests that surveyors do

Table 6

Respondent's belief that they have experienced food related illness and symptoms of diarrhea, nausea, or vomiting.

	Experienced food related illness			Experienced diarrhea, nausea, vomiting		
	Yes (%)	Total (N)	Chi-square	Yes (%)	Total (N)	Chi-square
Gender						
Females	43	705		71	705	
Males	46	289		56	289	
Total	43 ($n = 432$)	994	0.81	67 ($n = 662$)	994	19.05***
Ethnicity						
Asian	79	90		44	90	
Hispanic	59	113		58	113	
NHW	35	657		72	657	
Other	46	134		64	134	
Total	43 ($n = 432$)	994	74.83***	67 ($n = 662$)	994	30.82***
Age						
Young adults	88	422		62	422	
Middle aged adults	7	474		71	474	
Seniors	26	97		64	97	
Total	43 ($n = 431$)	993	608.76***	67 ($n = 661$)	993	9.31**
Education						
Low	35	146		56	146	
Medium	42	465		69	465	
High	48	383		67	383	
Total	43 ($n = 432$)	994	7.82*	67 ($n = 662$)	994	8.71*
Income						
Low	15	333		61	333	
Medium	14	327		66	327	
High	14	334		73	334	
Total	43 ($n = 432$)	994	0.04	67 ($n = 662$)	994	10.98**

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

NHW: non-Hispanic White.

not understand foodborne illness. Consistent with these findings, Knight et al. (2008) noted that the public underestimates the number of cases of foodborne illness and seem unfamiliar with factors that could result in illness. Asian respondents scored significantly lower on food safety awareness, responsibility, interest, and self-assessment of food safety knowledge, yet 79% recognized they have been affected by foodborne illness. Because foodservice hygiene is culturally bound, Asians have a different perception of food safety (Ungku Fatimah et al., 2011). Simpler food safety messages, with graphs and pictures, can help clear any confusion for any minority (Smerecnik et al., 2010).

5. Limitations

California and Florida have a large number of ethnic restaurants. Fifty percent of restaurants in California and 43% in Florida are ethnic compared to an average of one-third ethnic restaurants in the United States (Research Department, 2001). Respondents from other states may have a different view of Asian and Mexican food compared to those who live in an area where ethnic restaurants are less common.

The term “ethnic” was not defined in the survey. Mexicans and Asians may not see their own food as ethnic and can interpret the word differently. Also “Asian” is an umbrella term encompassing different cuisines depending on culture. Incorporating all types of Asian cuisines into one concept can cause uncertainty in how people answer general questions pertaining to Asian food.

People interpret numbers and scales differently, but for data analysis, it was assumed that respondents have the same understanding of numbers and scales as the researchers. As is common in use of a Likert type scale, we also assumed that the difference between a “strong” and “neutral” can be adequately represented by a set interval.

6. Conclusion

Respondents strongly believed that all restaurant employees should receive food safety training and inspections should be more frequent. People believed they were less likely to become ill from Mexican food than Asian. Young men and Asians were more likely than any demographic group to try a new ethnic restaurant.

Older people were more concerned with food safety than younger, women tended to be more aware and cautious than men, and highly educated consumers thought about food safety less often than those with lower education. People in this survey believed themselves to be knowledgeable about food safety, yet they failed to recognize signs of foodborne illness. The internet, television, newspaper, and word of mouth from friend or family continue to be the most widely used method of spreading food safety information.

Customers expect ethnic restaurants to adhere to food safety standards. While authenticity and ingredient quality were high priorities, ethnic restaurant owners should be aware that customers always see food safety as an underlying issue in restaurant selection and continued patronage. Regardless of demographics, people expected food safety in ethnic restaurants. These findings can be used to improve future food safety programs for the public as well as foodservice workers.

Acknowledgments

The authors thank the U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service National Integrated Food Safety Initiative (CSREES-NIFSI) (contract 2006-51110-03597) for funding this study.

References

- Ahmed, A. (2004). Flavor and taste perceptions of Asian foods. Available at http://www.preparedfoods.com/Articles/Feature_Article/e41d322e33788010VgnVCM100000f932a8c0 Accessed 23.10.09.
- Aksodyan, E. (2007). Hygiene factors influencing customers' choice of dining-out units: findings from a study of university academic staff. *Journal of Food Safety*, 27(3), 300–316.
- Altekruse, S. F., Street, D. A., Fein, S. B., & Levy, A. S. (1996). Consumer knowledge of foodborne microbial hazards and food-handling practices. *Journal of Food Protection*, 59(3), 287–294.
- Altekruse, S. F., Yang, S., Timbo, B. B., & Angulo, F. J. (1999). A multi-state survey of consumer food-handling and food-consumption practices. *American Journal of Preventive Medicine*, 16(3), 216–221.
- American Express MarketBrief. (May 2007). Ethnic foods are in fashion. In *Technomic*.
- Barber, N., & Scarcelli, J. M. (2009). Clean restrooms: how important are they to restaurant consumers? *Journal of Foodservice*, 20(6), 309–320.
- Brewer, M. S., & Rojas, M. (2008). Consumer attitudes toward issues in food safety. *Journal of Food Safety*, 28(1), 1–22.
- Buchholz, U., Run, G., Kool, J. L., Fielding, J., & Mascola, L. (2002). A risk-based restaurant inspection system in Los Angeles county. *Journal of Food Protection*, 65(2), 367–372.
- Byrd-Bredbenner, C., Maurer, J., Wheatley, V., Cottone, E., & Clancy, M. (2007). Food safety hazards lurk in the kitchens of young adults. *Journal of Food Protection*, 70(4), 991–996.
- Centers for Disease Control and Prevention. (2006). Surveillance for foodborne-disease outbreaks – United States, 1998–2002. *MMWR Surveillance Summaries*, 55(10), 1–42.
- Editorial. (2002). Making money can be as east as A, B, C, as posted grades pay off for good operators. *Nation's Restaurant News*, p.25 Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=7853839&loginpage=Login.asp&site=ehost-live> Accessed 23.10.09.
- Food Marketing Institute. (2009). *Consumers and food safety U.S. Grocery Shopper* (pp. 94–103). Arlington, Virginia: Food Marketing Institute.
- Franco, W., & Simonne, A. H. (2009). Mexican food safety trends: examining the CDC data in the United States from 1990 to 2006. *Food Protection Trends*, 29(4), 204–210.
- Hedberg, C. W., Smith, S. J., Kirkland, E., Radke, V., Jones, T. F., & Selman, C. A. (2006). Systematic environmental evaluations to identify food safety differences between outbreak and nonoutbreak restaurants. *Journal of Food Protection*, 69(11), 2697–2702.
- Hensley, S., & Bohm, E. (2000). Non-traditional ethnic cuisines gain in popularity. Available at <http://www.restaurant.org/pressroom/print/index.cfm?ID=126> Accessed 22.10.09.
- Hume, S. (2003). Research finds posted grades help hygiene. *Restaurants & Institutions*, 113(27), 71.
- Humphreys, J. M. (2009). *The multicultural economy 2009* (Third quarter ed.). In *Georgia business and economic conditions*, Vol. 69 Athens, GA: Terry College of Business.
- Irwin, K., Ballard, J., Grendon, J., & Kobayashi, J. (1989). Results of routine restaurant inspections can predict outbreaks of foodborne illness the Seattle-King County Washington USA experience. *American Journal of Public Health*, 79(5), 586–590.
- Jones, T. F., & Grimm, K. (2008). Public knowledge and attitudes regarding public health inspections of restaurants. *American Journal of Preventive Medicine*, 34(6), 510–513.
- Jones, T. F., Pavlin, B. I., LaFleur, B. J., Ingram, L. A., & Schaffner, W. (2004). Restaurant inspection scores and foodborne disease. *Emerging Infectious Diseases*, 10(4), 688–692.
- Knight, A. J., Worosz, M. R., Lapinski, M. K., Eyck, T. A. T., Harris, C. K., Bourquin, L. D., et al. (2008). Consumer perceptions of the food safety system: implications for food safety educators and policy makers. *Food Protection Trends*, 28(6), 391–406.
- Krueger, R. A. (1994). *Focus group: A practical guide for applied research* (2nd ed.). Thousand Oaks: Sage Publications.
- Kwon, J. H., Roberts, K. R., Shanklin, C. W., Liu, P., & Yen, W. S. F. (2010). Food safety training needs assessment for independent ethnic restaurants: review of health inspection data in Kansas. *Food Protection Trends*, 30(7), 412–421.
- Leach, J. (2003). *A guide to customer perceptions of food hygiene*. London, England: Chadwick House Publishing.
- Mauer, W. A., Kaneene, J. B., DeArman, V. T., Roberts, C. A., Miller, R., Pong, L., et al. (2006). Ethnic-food safety concerns: an online survey of food safety professionals. *Journal of Environmental Health*, 68(10), 32–38.
- Meer, R. R., & Misner, S. L. (2000). Food safety knowledge and behavior of expanded food and nutrition education program participants in Arizona. *Journal of Food Protection*, 63(12), 1725–1731.
- Mintel Oxygen Reports. (2009). Americans dish on ethnic fare. In *Mintel oxygen*, Chicago, IL.
- National Restaurant Association. (2010). *2010 Pocket factbook restaurant industry*. Washington, DC: National Restaurant Association.
- Niode, O. T. (2008). *Insight into Asian and Hispanic restaurant manager needs for safe food handling*. Thesis, University of California, Davis, Davis, CA.
- Ortman, J. M., & Guarneri, C. E. (2009). *United States population projections: 2000 to 2050*. Washington, DC. Retrieved from <http://www.census.gov/population/www/projections/analytical-document09.pdf> Accessed 20.02.10.

- Powitz, R. W. (August/September 2009). Ethnic foods and the sanitarian. *Food Safety Magazine*, 48–51.
- Redmond, E. C., & Griffith, C. J. (2004). Consumer perceptions of food safety risk, control and responsibility. *Appetite*, 43(3), 309–313.
- Research Department. (2001). Fullservice steams ahead. Available at <https://restaurant.org/tools/magazines/rusa/magArchive/year/article/?ArticleID=671> Accessed 08.04.10.
- Roberts, W. A. (2008). The Hispanic influence. Available at http://www.preparedfoods.com/Articles/Article_Rotation/BNP_GUID_9-5-2006_A_1000000000000254651 Accessed 23.10.09.
- Rudder, A. (2006). Food safety and the risk assessment of ethnic minority food retail businesses. *Food Control*, 17(3), 189–196.
- Simonne, A. H., Nille, A., Evans, K., & Marshall, M. R., Jr. (2004). Ethnic food safety trends in the United States based on CDC foodborne illness data. *Food Protection Trends*, 24(8), 590–604.
- Sloan, E. (2010). US consumers have a taste for world cuisines. *Food Technology*, 64, 19.
- Smerecnik, C. M. R., Mesters, I., Kessels, L. T. E., Ruiters, R. A. C., Vries, N. K. D., & Vries, H. D. (2010). Understanding the positive effects of graphical risk information on comprehension: measuring attention directed to written, tabular, and graphical risk information. *Risk Analysis*, doi:10.1111/j.1539-6924.2010.01435.x.
- Sukalakamala, P., & Boyce, J. B. (2007). Customer perceptions for expectations and acceptance of an authentic dining experience in Thai restaurants. *Journal of Foodservice*, 18(2), 69–75.
- Ungku Fatimah, U. Z. A., Boo, H. C., Sambasivan, M., & Salleh, R. (2011). Foodservice hygiene factors – the consumer perspective. *International Journal of Hospitality Management*, 30(1), 38–45.
- Weinstein, N. D., & Klein, W. M. (1996). Unrealistic optimism: present and future. *Journal of Social and Clinical Psychology*, 15(1), 1–8.
- Worsfold, D. (2006a). Consumer information on hygiene inspections of food premises. *Journal of Foodservice*, 17(1), 23–31.
- Worsfold, D. (2006b). Eating out: consumer perceptions of food safety. *International Journal of Environmental Health Research*, 16(3), 219–229.