Work Experience and Education: Their effect on food safety practices of university students

John R. Farrish  
*University of Nevada Las Vegas, farrishj@unlv.nevada.edu*

Miranda D. Kitterlin  
*University of Nevada Las Vegas, mkitterlin@hotmail.com*

Jean Hertzman  
*University of Nevada Las Vegas, jean.hertzman@unlv.edu*

John Stefanelli  
*University of Nevada Las Vegas, john.stefanelli@unlv.edu*
ABSTRACT

The continued prevalence of foodborne illness (FBI), the large population of young adults in the foodservice industry, and the contradictory results of previous studies indicate a need for further investigation of food safety practices among young adults. The goal of this study was to evaluate the personal food safety practices of undergraduate students based on their level of foodservice industry work experience and college major. Being a hotel major did significantly affect practices, but having foodservice work experience did not. This suggests that industry operators are not doing an adequate job of educating their staff about proper food safety practices.

Keywords: food safety practices, food safety education, university students, work experience

INTRODUCTION

Insufficient food safety practices are major contributors to the transmission of foodborne illness (FBI) (Mitchel, Fraser & Bearon, 2007). An estimated 76 million people in the United States fall victim to food-related illness each year; of these, an estimated 5000 incidents result in death (Mead, et al., 1999). Although the number of reported infections has steadily declined, foodborne disease remains a significant problem, in need of further efforts to prevent incident and sustain the decline (Center for Disease Control, 2005). This problem is intensified by the increase of at-risk populations, such as children, elderly people, and people with compromised immune systems, in the United States, with one-fourth of the population considered at increased risk for severe outcomes in the event of a foodborne disease (Byrd-Bredbenner et al., 2007).

Major incidences of foodborne illness illustrate the need for improved and continuous education regarding food safety practices. For example, in summer 2007, Topps Meat factory engaged in unsafe food safety practices, causing at least 40 people to become ill. This prompted the second-largest beef recall in history (Drew & Martin, 2007). Twenty-six confirmed cases of illness and twelve deaths resulted in a nationwide recall of Maple Leaf Foods products in 2008 (Austen, 2008).

Research shows that young adults (ages 18-29) have a greater propensity to participate in risky behaviors, and are prone to violate many food safety precautions. There is speculation that lifestyle changes, including the proliferation of eating occasions, the increase of mothers who work outside of the home, and an increased consumption of prepared foods over the last quarter century, have contributed to a lack of safe personal food handling activity (Byrd-Bredbenner et al., 2007). Numerous other authors suggest that college students are more
susceptible to foodborne illness due to their frequent adoption of unsafe food handling behavior and preparation
practices (Altekruse, et al, 1999; Morrone & Rathburn, 2003; Roseman & Deale, 2008; Unklesbay, Sneed & Toma,
1998).

The continued prevalence of food-related illness, the large population of young adults in the foodservice
industry, and the contradictory results of previous findings indicate that there is a need for further investigation in
this area. This article reports a portion of a study that utilized a modified version of Unklesbay, Sneed, and Toma’s
(1998) survey to evaluate the effect of college major and foodservice industry experience on college students’
personal food safety practices.

LITERATURE REVIEW

Several studies indicate that young adults (ages 18 to 29) are the most likely age group to participate in
risky food-handling behavior (Altekruse, et al., 1999; Byrd-Bredbenner, 2007; Klontz, et al., 1995; Li-Cohen &
Bruhn, 2002; Morrone & Rathburn, 2003; Patil, Cates, & Morales, 2005; Roseman & Deale, 2008). This risky
behavior is a major concern for public health and the hospitality industry, as a large number of young adults hold
employment in foodservice. According to the National Restaurant Association (2009), more than 25 percent of
adults had their first job in a restaurant. A 2007 study by Byrd-Bredbenner, et al., found that college students
reported less than optimal levels of safe food handling practices, with mean scores of 50-60% on best practices and
knowledge measures. In addition, many of these college students reported regular engagement in unsafe eating
behaviors, such as consuming risky foods such as raw cookie dough and undercooked beef.

A 1998 study by Unklesbay, Sneed, and Toma found that college students in food-related and health
programs scored significantly higher in areas of attitude, practice, and knowledge of food safety than students in
other disciplines. Altekruse, Yang, Timbo and Angulo (1999) reported unsafe food handling practices to be more
common among men, young adults, and occasional food preparers. In 2000, Shiferaw, et al found that young adults,
males, and individuals with higher education commonly failed to engage in safe food handling behavior, including
hand washing and washing cutting boards after working with raw meats. Results of a 2004 study by Redmond and
Griffith indicate that the young adult population was associated with negative attitudes towards the implementation
of food safety behavior.

In 2005, Lin and Sneed found that student workers in university foodservice facilities who had taken food
safety classes demonstrated better food safety practices on the job. A 2005 study by Garayoa, Cordoba, Garcia-
Jalon, Sanchez-Villegas, and Vitas found that although students with food safety education showed a greater
knowledge of pathogens and other food safety topics, these higher levels of knowledge did not create higher levels
of safe practices. More recently, Roseman and Deale (2008) found that work experience had an impact on students’
perception of their food safety knowledge and skills, but academic courses and food safety certification did not.

McArthur et al. (2006) performed an assessment of university undergraduates with regards to their
frequency of compliance with food safety recommendations. Their findings further supported previous statements
that college students engage in preparation practices that place them at a greater risk to foodborne illness, including
unsafe preparation practices for meats, eggs, and poultry. In addition, no significant difference was seen among
students majoring in health-related disciplines and those majoring in other areas of study. A meta-analysis of 20
studies published between 1992 and 2005 was performed by Patil, Cates, and Morales (2005); key findings showed
that, for all classes of consumers, food safety knowledge did not correspond with actual practice.

Similar patterns have been found in industry. Several studies of employees in foodservice establishments
showed that although they had sufficient knowledge of safe food-handling concepts, observation of actual practice
identified a number of concerns (Hertzman & Barrash, 2007; Sneed, Strohbehn, & Gilmore, 2004). Other studies
show that food handlers displayed positive attitudes towards the prevention of foodborne illness, yet they lacked
basic knowledge and failed to exhibit satisfactory food handling behavior (Angelillo, Viggiani, Rizzo, & Bianco,

The most renowned food safety training program in the United States is the ServSafe Food Safety Program,
which is sponsored by the National Restaurant Association Educational Foundation (NRAEF). In order to obtain
ServSafe certification, participants must complete a 90-question exam with a minimum score of 75%. Several
researchers, such as Ravel-Nelson and Smith (1999), indicate that the program contributes substantially to 2
increasing food safety knowledge. Prominent hospitality and culinary programs such as Johnson & Wales University, University of Nevada, Las Vegas, and Culinary Institute of America require all students to be certified (Hertzman, 2004). In total, Scheule (2000) found that 45% of hospitality faculty surveyed said that food safety certification was required for graduation and 28% reported that it was optional.

RESEARCH QUESTIONS
The goal of this study was to evaluate the personal food safety practices of United States undergraduate students based on their level of foodservice industry work experience and enrollment in a hospitality program. This article reports on the following research questions:

1. Do the personal food safety practices of hospitality management undergraduate students differ from those of students in other major areas of study?
2. Do personal food safety practices of undergraduate students differ based on the number of years they have worked in the foodservice industry?
3. Is there a significant interaction effect between college major (hospitality vs. non-hospitality) and food service work experience and the observance of food safety practices among university students?

METHODOLOGY
Population and Sampling Frame
The population for this study was undergraduate students at a metropolitan university in the Southwest. Students in the hotel administration degree program must take a Foodservice Sanitation course. The ServSafe test is used as the final exam for the course. Students do not receive a passing grade in the class until they earn a satisfactory score on the exam. Being located in a major resort and convention city, a large percentage of students from all disciplines work in the foodservice industry and it would be assumed they had received some type of on-the-job food safety training.

The investigators used convenience sampling to target students in introductory classes in hospitality, biology, and history and upper-division hospitality and business classes. They believed these courses would have students from all majors and class standings. All students present on the day they administered the survey were eligible to participate in the study.

Instrument
The survey instrument used questions from a previously validated survey first reported in Unklesbay, Sneed, and Toma (1998). Some questions were modified to reflect current standards from the Food and Drug Administration’s Model Food Code. The practices section asked students to state how often they followed ten specific food safety practices on a four-point Likert-type scale from Never (1) to Always (4). Another section contained demographic questions regarding the students’ gender, college major, quantity of foodservice education, and amount of foodservice work experience.

DATA ANALYSIS AND DISCUSSION
Response Rate
A total of 1264 students were present in the 21 classes in which the investigators administered the survey. The researchers received 992 completed surveys for an overall response rate of 78.48%. Not all respondents answered all the questions regarding practices or demographics. These responses were not included in the data analysis. Therefore, although 992 students took the survey, only 939 responses were included in the data analysis for a valid response rate of 74.2%.

Demographics
The majority of the respondents (62.5%) were female, while 37.5% were male. Their age ranged from 16 to 65, with a mean age of 22 years old. The respondents represent thirty-six different majors from ten colleges. For data analysis, the researchers formed two groups, non-hotel majors and hotel majors. 401 (42.8%) of the respondents were non-hotel majors while 538 (57.2%) were hotel majors.

Thirty percent of the participants stated they had received no food safety education. Over 26% had taken a college course, while 24.3% had received on-the-job training (OJT). Over 15% had both a college course and OJT.
The remainder had participated in other types of food safety training, such as military or high school courses or some combination of other courses and OJT and college courses.

Those with more than three years of work experience in the food service industry were considered to have high experience and those with three years or less work experience were considered to have low experience. One hundred thirty-five participants were placed into the high experience category and 804 respondents were placed in the low experience category.

**Overall Practices Means**

There were a total of ten questions on the questionnaire regarding respondent food safety practices, all of which were measured on a four-point Likert scale from “Never” to “Always,” the “Always” response in all cases representing the better safety practice. Table 1 shows the overall means for each question on this four-point scale. The higher the total score, the better the food safety practices of the respondent. The means were above three, meaning students usually followed these practices, on seven of the questions. However, on questions regarding whether they checked the temperatures of their refrigerators or freezers or complained to managers about unsanitary tableware, the means were close to two indicating they seldom followed these practices.

To test the three research questions, the investigators conducted a two-way analysis of variance with college major (hotel major vs. all others) and experience in the food service industry being the independent variables. They first tested the sample to determine if it met the Levene requirement for homogeneity of variance. The significance of the Levene’s test was .389 (F = 1.007, df1 = 3, df2 = 935), indicating that the sample met the requirement. The dependent variable was a calculated sum of all the respondent scores from the safety practices portion of the distributed questionnaire. Table 2 shows these calculated sums for each combination of the independent variables. Table 3 contains the results of the two-way ANOVA.

### Table 1

**Overall Practices Means**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>I discard food that is past its expiration date.</td>
<td>3.61</td>
<td>.575</td>
</tr>
<tr>
<td>I refrigerate leftovers immediately after a meal is eaten.</td>
<td>3.28</td>
<td>.716</td>
</tr>
<tr>
<td>I wash cutting boards and knives in between cutting different food products, such as vegetables and chicken.</td>
<td>3.42</td>
<td>.543</td>
</tr>
<tr>
<td>I serve foods immediately after they are cooked.</td>
<td>3.47</td>
<td>.763</td>
</tr>
<tr>
<td>I wash fruits and vegetables before eating or preparing them.</td>
<td>3.64</td>
<td>.608</td>
</tr>
<tr>
<td>I follow label instructions for storing and preparing packaged foods.</td>
<td>3.33</td>
<td>.734</td>
</tr>
<tr>
<td>I heat leftover foods, such as spaghetti, to 165º F before serving them.</td>
<td>3.01</td>
<td>.793</td>
</tr>
<tr>
<td>I select a restaurant based on its reputation for good sanitation and cleanliness</td>
<td>2.73</td>
<td>.875</td>
</tr>
<tr>
<td>I check the temperatures of my refrigerator and freezer.</td>
<td>2.17</td>
<td>.944</td>
</tr>
<tr>
<td>In restaurants, I ask to speak to a mgr when dishes or utensils are dirty.</td>
<td>2.21</td>
<td>.991</td>
</tr>
</tbody>
</table>

Scale: 1 (Never), 2 (Seldom), 3 (Usually), 4 (Always)
Table 2
Descriptive Statistics of Dependent Variables

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Work Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hotel Major</td>
<td>30.69</td>
<td>4.22</td>
<td>364</td>
</tr>
<tr>
<td>Hotel Major</td>
<td>31.02</td>
<td>4.08</td>
<td>440</td>
</tr>
<tr>
<td>Total</td>
<td>30.88</td>
<td>4.14</td>
<td>804</td>
</tr>
<tr>
<td>High Work Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hotel Major</td>
<td>30.00</td>
<td>4.60</td>
<td>37</td>
</tr>
<tr>
<td>Hotel Major</td>
<td>31.43</td>
<td>3.84</td>
<td>98</td>
</tr>
<tr>
<td>Total</td>
<td>31.04</td>
<td>4.10</td>
<td>135</td>
</tr>
<tr>
<td>Total Non-Hotel Major</td>
<td>30.63</td>
<td>4.25</td>
<td>401</td>
</tr>
<tr>
<td>Hotel Major</td>
<td>31.09</td>
<td>4.04</td>
<td>538</td>
</tr>
<tr>
<td>Total</td>
<td>30.89</td>
<td>4.13</td>
<td>939</td>
</tr>
</tbody>
</table>

The interaction effect was found to be insignificant (p > 0.05), and the main effect of work experience was also not significant (p > 0.05). The main effect of major, however, was found to be significant (p < 0.05). Since the independent variables are dichotomous there was no need to conduct a Tukey or Bonferroni follow-up analyses.

Table 3
Test for Significance of Work Experience and College Major on Food Safety Practices

<table>
<thead>
<tr>
<th>Dependent Variable: Practice Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
</tr>
<tr>
<td>Corrected Model</td>
</tr>
<tr>
<td>Intercept</td>
</tr>
<tr>
<td>Work Experience High / Low</td>
</tr>
<tr>
<td>Hotel Major</td>
</tr>
<tr>
<td>Work Experience High / Low * Hotel Major</td>
</tr>
<tr>
<td>Error</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Implications

The most important finding of this study is that there is a positive correlation between being a hotel major and better food safety practices among the sample population. This finding suggests that there is something about the coursework that hotel majors complete that leads them to use better food safety practices. These majors receive food safety training in a number of different courses, including one course devoted solely to sanitation practices that non-majors are not required to, and consequently rarely, take in school. This would suggest that hotel majors are not only receiving better food safety training than non-majors, which is to be expected, but that they are receiving better food safety training than food service professionals who have not received the training that hotel majors receive.

The study failed to find any significant interaction effect between food and beverage work experience and college major on self-reported food safety practices. Further, it failed to identify any significant impact of years of food service work experience and self-reported food safety practices. The fact that there was no significance found for the main effect of food and beverage work experience is, in itself, significant. This finding suggests that industry operators are not doing an adequate job of educating their staff regarding proper food safety practices. The implications of this lack of training could be quite serious when the cost of an FBI outbreak is taken into account. This finding further suggests that operators might not be fully cognizant of the costs associated with an outbreak of FBI and how training could minimize the risk of these costs.
The implications for educators and operators in the food service industry are significant. For educators, it is important to continue the practice of requiring that students to take courses that include food safety training. For operators, the results of this study suggest that they are incurring substantial risk. Since the cost of a single FBI outbreak can run into millions of dollars, operators should devote more attention to addressing proper food safety practices with employees.

Limitations, Future Research, and Conclusion

This study was limited by the sampling method. Since the researchers used convenience sampling – the survey was administered only in certain classes and only students in attendance on that particular day were included – it may not be representative of the entire population. The high percentage of hotel majors is not the same as the percentage of hotel majors as compared to other majors in the university as a whole. Using the university e-mail system to e-mail the survey to all students may have elicited a more random sample, but most likely with a much lower response rate. The researchers should also conduct the survey with students at other universities with hospitality programs to determine if the findings can be generalized. They also could conduct the survey with current employees of foodservice operations.

The researchers collected data on many other demographic variables as well as the knowledge of and attitudes towards food safety. They plan to conduct further data analysis using other statistical procedures, such as factor analysis and regression, to investigate groupings of dependent variables within the categories and whether a predictive relationship can be established between the independent variables and dependent variables.

The study certainly highlights the need for future research. The first, and most important area, will be to evaluate current industry practices regarding food safety training. Since this study demonstrates that food service work experience does not lead to better food safety practices it can be assumed that food service employees are not receiving adequate training. Future research should focus on why this occurs; whether it is a result of inadequate understanding of the risk, inadequate funding, or other factors. Industry’s failure to adequately educate its work force represents an ongoing public health hazard. For educators, further study of exactly what portions of the hospitality curriculum lead to better food safety practices is warranted. By determining what training best translates into good practice, future hospitality managers entering the work force will be better able to train employees in the use of proper food safety practices.

References


