

From the Editor

This journal has its' origins from a question – where can foodservice professionals, educators, and researchers locate high quality research on college and university foodservice? The Journal of Foodservice Research & Education is the result of the collaboration between the National Association of College and University Foodservices (NACUFS) and the Foodservice Management Education Council (FSMEC). The first issue has five articles on topics ranging from food safety to customer satisfaction.

The editorial board has worked hard to establish rating criteria. I am grateful for their expertise in manuscript review. The board members are:

Janice Boyce

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Mary Frances Nettles

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Jeannie Sneed

Duane Langshaw(SurvNet.com) has done a great job with the journal layout.

The Journal welcomes high quality manuscripts from foodservice professionals, researchers, and educators. Please check the Author Guidelines for submission information.

It has been a pleasure working with the editorial board and Mr. Langshaw. A special thank you goes to Mary Molt and Jeannie Sneed for taking the initiative to have the journal go from good idea to reality and for helping me get the Journal off the ground.

**"University Foodservice Managers' and Employees'
Perceptions of Food Safety Training and Managers'
Comparison of Student and Full-Time Employees Food Safety Practices**

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ABSTRACT

Food safety is a critical issue facing the foodservice industry. Foodservice workers play a major role in preventing outbreaks of foodborne illness and meeting the goal of serving safe food. The purpose of this study was to compare food safety topics that were included in training or orientation from student and full-time employees' and managers' perspectives and to determine foodservice managers' perceptions of student employees' food safety practices compared to those of full-time employees in one university foodservice operation.

Written surveys were distributed to student and full-time employees and managers at their workplace. Surveys were returned by 221 student employees (40%), 38 full-time employees (38%), and 16 managers (84%). The majority of student employees (65%) had worked only one or two semesters for university foodservice. For nine of 16 food safety topics, 80% or more students reported training had been received. Over 92% of full-time employees reported to have had training in 15 areas, for procedures in cleaning and sanitizing dishes only 75% reported to have training. Topics where fewer student employees reported training related to hand maintenance (short fingernails, no polish) and cross contamination, and 14% reported that they did not have training related to handwashing. Managers reported no difference between student and full-time employees for eight practices, but observed worse performance in students for seven practices. Training emphasis needs to be given to handwashing and cross contamination in this operation. This study points out the need for university foodservice managers to evaluate training effectiveness.

INTRODUCTION

Foodborne illness can be caused by employees' lack of food safety knowledge and poor personal hygiene (Bryan, 1988; Cohen, Reichel, & Schwartz, 2001; GAO, 1996; Harrington, 1992; Olsen et al., 2000). People are primary agents for spreading contamination, and food handlers can contaminate food by transmitting microorganisms, thus, causing a foodborne illness (NRAEF, 2004). Improper holding temperature, inadequate cooking, and poor personal hygiene were the top three improper food preparation practices that contributed to foodborne illness from 1988 through 1992 (Bean, Goulding, & Angulo, 1996) and from 1993 through 1997 (Olsen et al., 2000). Several studies have reported inappropriate food handling practices in school foodservice, such as unsafe food handling with bare hand contact, infrequent changing of gloves between tasks, insufficient handwashing, inappropriate hair restraints, improper eating and drinking in food preparation areas, and inadequate cleaning and sanitation of utensils, equipment, and facilities (Giampaoli, Cluskey, & Sneed, 2002; Gilmore, Brown, & Dana, 1998; Henroid & Sneed, 2004). There is a paucity of observational studies conducted in college and university foodservices.

It is not uncommon for university foodservice managers to hire part-time student employees with no foodservice experience. In addition, many student employees work in university foodservice for only one or two semesters and leave for employment in other fields (Fiihr, 2001). As a result, student employees may have less awareness of and concern about principles of food safety than full-time employees.

It is very important for managers to educate all employees about food safety, train them to use appropriate food handling procedures, and monitor their performance. To ensure safe food handling and change incorrect food handling behaviors, employees must be provided with

accurate knowledge and be motivated to apply that knowledge. Moreover, ongoing reinforcement of training programs must be given regularly in the workplace so that employees consistently use desired food handling practices (Rennie, 1994). Penner, Shanklin, and Thomson (1997) stated that managers have a responsibility to train employees when they are first hired. These researchers found that managers and employees needed more food safety training than currently provided.

Several challenges to providing training exist in foodservice. Lydecker (1991) stated that challenges to planning successful food safety training program in foodservice operations include 1) scheduling blocks of time for different shifts, 2) having high turnover rates that create a constant need for training new employees, and 3) delivering food safety concepts to employees with limited education or those who speak English as a second language.

The purpose in this study was to compare food safety topics included in training or orientation programs from student and full-time employees' and managers' perspectives and determine managers' perceptions of student employees' food safety practices compared to those of full-time employees in one university foodservice operation. Results of this study provide baseline data to support university foodservice managers in developing and evaluating training programs to improve food safety practices.

Methods

Sample

A convenience sample of 547 student employees, 91 full-time employees, and 19 managers working in six residence dining centers in one self-operated dining services at a Midwestern land-grant university was used. Employees from other department operations such

as convenience stores, catering, and central bakery were not included in this study to control for job variations.

Questionnaire Design

Two questionnaires were developed for the study, one for employees and one for managers. The employee questionnaire, developed to identify food safety topics employees perceived to be taught to them during orientation or on-the-job training, was identical for student and full-time employees except for demographic items. Food safety topics were identified based on the *ServSafe Coursebook* (2002), the FDA Food Code (1997), and common food handling errors observed in foodservice (Giampaoli, Cluskey, & Sneed, 2002; Gilmore, Brown, and Dana, 1998; Henroid & Sneed, 2004). For 16 food safety topics, respondents were asked to indicate whether food safety training related to this topic had been provided at the current workplace by checking yes or no. No other response choices were given. The questionnaire was pilot tested by 20 undergraduate students who work in foodservice, but not currently in university foodservice. Changes were made to the questionnaire to improve readability.

A second questionnaire was developed to survey managers to determine if 16 food safety topics were included in orientation or training provided to student employees (using responses of yes and no) and to determine how student employees' performance in those areas compared to full-time employees' performance (using responses of "better", "same", or "worse"). This questionnaire was critiqued by three faculty members and three graduate students with foodservice management experience (half of whom had university foodservice experience) to ensure validity.

The research protocol and questionnaires were approved by the University Human Subjects Research Office prior to data collection. Approval of the project also was obtained

from the director and assistant director of Dining Services.

Data Collection

A questionnaire and cover letter were distributed to all student employees before or after they had clocked out for a shift by the researcher. Copies were placed under the time clock for student employees who were willing to participate in this study but were not present at the time of distribution. A questionnaire and cover letter were placed in full-time employees' work mailboxes. Employees placed completed questionnaires in designated sealed boxes in managers' offices. To encourage participation, respondents could sign up for two prize drawings. A questionnaire, cover letter, and return envelope were mailed to all managers (n=10) in six university dining centers. Managers returned completed questionnaires by campus mail.

Data Analyses

SPSS version 11.0 for Windows was used for all data analyses. Descriptive statistics, including frequencies and percents, were calculated for all variables. Chi-square analysis was used to compare student and full-time employees' perceptions of training related to food safety topics. Because of differences in sample size, the expected count for each group was examined and if the count were less than five, a comparison could not be done. Comparisons could not be done for four of the 16 topics. A probability of less than or equal 0.05 was considered significant.

RESULTS AND DISCUSSION

Demographic Information

Questionnaires were returned by 221 student employees, representing 40% of all student employees. Questionnaires were completed by 38 full-time employees, a 42% response rate.

Perceptions of Employee Food Safety Training

Sixteen questionnaires were completed by managers for an 84% response rate. Selected demographic characteristics of student and full-time employees are presented in Table 1. The majority (65%) of student employees reported to have been employed one or two semesters.

Training Related to Food Safety Topics

Student and full-time employees were asked to indicate what food safety topics had been included in training that they had received at their current place of employment. The Cronbach alpha reliability coefficient for the 16 training items was 0.87. Table 2 presents the number and percent of employees who perceived that they had received training related to 16 food safety topics.

Full-time employees reported more training on 11 of 16 food safety topics ($p \leq 0.05$) than student employees, which may reflect more longevity with dining services. There was only one topic, “procedures for cleaning and sanitizing glassware, silverware, and dishes”, for which full-time employees had a lower percent of yes responses than student employees. This perhaps reflects the high number of student employees assigned to dishroom duties compared to a very small number of full-time employees.

“Preventing cross contamination” and “temperature danger zone” were the two topics for which the smallest percent of student employees reported training. Again, this may reflect that a lower proportion of student workers are involved in food preparation compared to full-time employees. However, “preventing cross contamination” would be an essential concept for students involved in other areas, especially service and dishwashing.

Table 3 presents student employees’ and managers’ perceptions of food safety training. Generally, the proportion of students and managers who believed that training had been given for each topic was similar. Nearly 14% of student employees reported that they did not receive

training on proper handwashing procedures, yet 15 of 16 managers believed that training had been given. These results indicate that attention to training of student employees is needed for areas of proper handwashing, hand maintenance, role of personal hygiene in disease, and cross contamination.

Comparison of Student and Full-Time Employees' Food Safety Practices

Table 4 presents managers' comparison of student employees' performance related to food safety practices to full-time employees. The majority of managers indicated that student employees had worse performance than full-time employees for seven of 16 listed food safety practices. Many of these practices, such as proper handwashing and preventing cross contamination, are critical for food safety. For eight practices, the majority of managers indicated that there was no difference in performance between students and full-time employees.

CONCLUSIONS AND APPLICATIONS

This study reveals that there are differences in perceptions of food safety training for student and full-time employees. Differences probably reflect factors such as time employed with Dining Services, type of training given to student and full-time employees (full-time employees are provided ServSafe training), and differences in job responsibilities. Some food safety topics may not be essential to the job responsibilities of student employees, such as use of thermometers or the temperature danger zone. Nearly 40% of student employees did not perceive that they had training related to preventing cross contamination yet that is a critical responsibility for all jobs. Also, nearly 14% of students did not perceive that they had training related to proper handwashing. This is a concern because inadequate handwashing was often

observed in research studies of foodservice operations (Giampaoli, Cluskey, & Sneed, 2002; Gilmore, Brown, & Dana, 1998; Henroid & Sneed, 2004).

Most managers in this study believed that they had provided training related to handwashing, while some students did not believe that they had received training. This difference in perceptions may indicate that orientation programs need to be strengthened and that more emphasis needs to be given on basic tasks. One strategy might be to provide training, a handout, and have employees sign off that training had occurred. A written test would be another strategy to reinforce training and provide feedback to managers.

Results of this study also may support the need to have on-going training. Perhaps managers provide training but it is not internalized by employees. Reinforcement of training through techniques such as use of posters and continual monitoring of performance by managers and co-workers may change employees' perceptions of training that they receive.

A survey of employees' perceptions of training could be a useful tool for foodservice managers to assess the effectiveness of training. Planned observational studies in foodservice operations would be another approach to determine if training leads to implementation of appropriate food handling behaviors. Future research also could explore gaps between knowledge of food safety and food handling practices (behavior).

Table 1. Demographic Characteristics of Student (N = 221) and Full-Time Employees (N = 38)

Characteristic	<u>Student</u> n (%)		<u>Full-Time</u> n (%)
Age (years)		Age (years)	
18-19	105 (47.5%)	<30	9 (23.7%)
20-21	81 (36.7%)	31-50	15 (39.5%)
22-23	27 (12.2%)	51-65	12 (31.6%)
24-28	6 (2.7%)	>65	1 (2.6%)
Gender		Gender	
Female	135 (61.1%)	Female	34 (89.5%)
Male	86 (38.9%)	Male	4 (10.5%)
Country		Education level	
United States	207 (93.7%)	High school	15 (39.5%)
International	14 (6.3%)	Some college	16 (42.1%)
College status		Bachelor's degree	1 (2.6%)
Freshman	85 (38.5%)	Years worked in Dining Services	
Sophomore	65 (29.4%)	≤5	18 (47.4%)
Junior	39 (17.6%)	6-15	12 (31.6%)
Senior	32 (14.5%)	16-25	6 (15.8%)
College or Major		≤26	1 (2.6%)
Liberal arts and sciences	71 (32.1%)	Number of food safety training sessions received in current job	
Engineering	38 (17.2%)	0	0 (0%)
Business	32 (14.5%)	1-2	17 (44.7%)
Education	17 (7.7%)	3-4	5 (13.2%)
Design	15 (6.8%)	5-6	2 (5.3%)
Family and consumer Sciences	15 (6.8%)	>6	8 (21.1%)
Agriculture	9 (4.1%)	Food safety certification	
Undecided	6 (2.7%)	Yes	27 (71.1%)
Food science and human nutrition	5 (2.3%)	No	5 (13.2%)
Hotel, restaurant, and institution management	5 (2.3%)		

Table 1. (Continued)

Characteristic	<u>Student</u> n (%)
Position	
Student employee	188 (85.1%)
Student supervisor/leader	33 (14.9%)
Hours worked	
<10 hrs/wk	11 (5.0%)
10-15 hrs/wk	144 (65.2%)
16-20 hrs/wk	61 (27.6%)
Semesters employed by Dining Services	
1-2	144 (65.2%)
3-4	38 (17.2%)
5-6	24 (10.9%)
>6	13 (5.9%)
Number of on-the-job food safety training received in current job	
0	30 (13.6%)
1-2	117 (52.9%)
3-4	40 (18.1%)
5-6	8 (3.6%)
>6	1 (0.5%)

Note. Percentages may not total 100% due to non-response to a question.

Table 2. Comparison^a of the percent of student (N = 221) and full-time (N = 38) employees' who perceived that training on food safety topics was provided in their current job

Training Topics	Student		Full-time		X ²
	n	%	n	%	
Proper work attire (e.g. hair restraint, uniform)	214	97.7%	38	100%	
Use of gloves	207	95.0%	38	100%	9.0*
General personal cleanliness	192	88.9%	37	97.4%	
Procedures for cleaning and sanitizing glassware, silverware, and dishes	190	86.8%	28	75.7%	
Proper handwashing	188	86.2%	37	97.4%	
Reporting illness and injury	185	84.5%	37	97.4%	4.6*
Policies regarding eating and drinking in work area	178	81.3%	36	94.7%	4.2*
Procedures for cleaning and sanitizing utensils, equipments, and food contact surfaces	177	80.8%	37	97.4%	12.1***
Hand maintenance (e.g. short fingernails, no nail polish)	175	80.3%	38	100%	6.4*
Safe serving procedures	168	76.7%	36	94.7%	3.1
Use of thermometers and taking temperatures of food	163	74.4%	36	94.7%	22.4***
Types of chemicals used in the dining center and how to safely store and use	157	71.7%	35	92.1%	9.8**
The relationship between personal hygiene and the spread of disease	155	70.8%	37	97.4%	6.4*
Holding foods for service	154	70.6%	36	94.7%	21.3***
Preventing cross contamination	133	60.7%	38	100%	7.6**
Temperature danger zone where microorganisms can grow rapidly	113	52.1%	35	92.1%	7.1**

NOTE: Employees were asked to indicate whether or not (Yes or No) they had training related to food safety topics at their current place of employment.

^aChi square analysis was done to compare the two groups. Because of sample size differences, expected scores were calculated. If the expected score was less than five, a comparison could not be made.

* p ≤ 0.05

** p ≤ 0.01

*** p ≤ 0.001

Table 3. Comparison of Food Safety Training Provided from the Perspective of Student Employees (N = 221) and Managers (N = 16)

Training Topics	Students		Managers
	n	%	n
Proper work attire (e.g. hair restraint, uniform)	214	97.7%	16
Use of gloves	207	95.0%	16
General personal cleanliness	192	88.9%	14
Procedures for cleaning and sanitizing glassware, silverware, and dishes	190	86.8%	15
Proper handwashing	188	86.2%	15
Reporting illness and injury	185	84.5%	14
Policies regarding eating and drinking in work area	178	81.3%	16
Procedures for cleaning and sanitizing utensils, equipments, and food contact surfaces	177	80.8%	16
Hand maintenance (e.g. short fingernails, no nail polish)	175	80.3%	15
Safe serving procedures	168	76.7%	14
Use of thermometers and taking temperatures of food	163	74.4%	14
Types of chemicals used in the dining center and how to safely store and use	157	71.7%	12
The relationship between personal hygiene and the spread of disease	155	70.8%	12
Holding foods for service	154	70.6%	11
Preventing cross contamination	133	60.7%	13
Temperature danger zone where microorganisms can grow rapidly	113	52.1%	8

NOTE: Employees were asked to indicate whether or not (Yes or No) they had training related to food safety topics at their current place of employment. Managers were asked to indicate if training is given to student employees in their operation using Yes or No responses

Table 4. Managers' Comparison of Student and Full-Time Employees' Performance Related to Food Safety Practices (N = 16)

Food Safety Practices	Worse	Same	Better
	n	n	n
Proper work attire (e.g. hair restraint, uniform)	13	3	0
Preventing cross contamination	13	1	1
Hand maintenance (e.g. short fingernails, no nail polish)	12	3	1
Policies regarding eating and drinking in work area	11	5	0
Temperature danger zone where microorganisms can grow rapidly	11	4	1
Proper handwashing	9	6	1
Safe serving procedures	9	6	1
Holding foods for service	8	7	1
Procedures for cleaning and sanitizing utensils, equipment, and food contact surfaces	6	9	1
Use of thermometers and taking temperatures of food	6	9	1
The relationship between personal hygiene and the spread of disease	5	10	1
Types of chemicals used in the dining center and how to safely store and use	5	10	1
Procedures for cleaning and sanitizing glassware, silverware, and dishes	3	12	1
General personal cleanliness	2	13	1
Reporting illness and injury	2	11	3
Use of gloves	1	12	3

Note. Percentage may not total 100% due to non-response to a question.

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University Foodservice Employees' Food Safety Knowledge, Attitudes, Practices, and Training

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University Foodservice Employees' Food Safety Knowledge, Attitudes, Practices, and Training

ABSTRACT

Foodservice workers play a major role in preventing outbreaks of foodborne illness and in meeting the goal of serving safe food. The purpose of this study was to assess foodservice employees' knowledge, attitudes, practices, and training regarding food safety at one midwestern university. Comparisons were made between student and full-time employees. Full-time employees had higher ($p \leq 0.001$) mean total scores for food safety knowledge, attitudes, practices, and training than student employees. Emphasis on food safety training for student employees is needed to ensure these employees have appropriate food safety knowledge and attitudes and to ensure that food safety practices are followed.

INTRODUCTION

Food safety is a critical issue facing the foodservice industry. An understanding of food safety procedures and potential factors that cause foodborne illness is very important for all food handlers. Cohen, Reichel, and Schwartz (2001) stated “only knowledgeable, motivated, and skilled employees who are trained to follow the proper procedures together with management that effectively monitors employees’ performances can ensure food safety” (pp. 6-7). Foodservice workers play a major role in prevention and control of outbreaks of foodborne illness.

University foodservice managers typically employ a large number of part-time employees to provide flexibility in staffing (Neumann, Stevens, & Graham, 2001). It is not uncommon that university foodservice managers hire many part-time and international student employees with no foodservice experience. In addition, many student employees work in university foodservice for only one or two semesters and leave for employment in other fields (Fiihr, 2001). As a result, student employees may have less awareness of and concern about principles of food safety than full-time employees. It is very important for managers to educate both student and full-time employees about food safety, train them to use appropriate food handling procedures, and monitor their performance.

Several studies have been conducted to assess college students’ and foodservice employees’ food safety knowledge, attitudes, practices, and training. Unklesbay, Sneed, and Toma (1998) studied college students’ attitudes, practices, and knowledge of food safety. Results showed that students in dietetics, food science, nutrition, and health programs had higher attitude scores compared to students in other majors. Females, upperclassmen, graduate students, and those who took at least one course related to food safety had higher mean scores for

food safety knowledge, attitudes, and practices than males, freshmen and sophomores, and those who had not taken a food safety course. These researchers suggested that all educators in food-related disciplines should educate college students about the importance of consumer food handling behaviors and the fact that consumers share responsibility for food safety.

Wie and Strohbahn (1997) studied the impact of a sanitation and food safety course on attitudes and knowledge of hospitality students. These researchers analyzed data from 68 students required to take a sanitation and safety course in the hospitality major. Researchers compared students' knowledge and attitudes toward sanitation and food safety before and after completion of the course. Results of this study showed students' knowledge and attitudes improved after completion of the course. They concluded that offering a foodservice sanitation and safety training course, coupled with continuing education, was very important for increasing knowledge.

Cushman, Shanklin, and Niehoff (2001) conducted a study to measure personal hygiene practices of part-time student employees in three on-site foodservice facilities in one university. Findings of this study showed that female student employees had higher mean hygiene practice scores than male student employees. This study also showed that the length of employment with the facility or organization influenced personal hygiene practices negatively. These researchers concluded that the majority of part-time student employees performed personal hygiene practices properly.

Hsu and Huang (1995) studied sanitation knowledge, attitudes, and behaviors of 178 university foodservice non-managerial workers in nine universities. Results indicated that foodservice workers were most knowledgeable about dishwashing procedures (91.9%) and mold-related food poisoning issues (88.6%). Respondents were least knowledgeable about

microorganisms (68.2%). Results also showed that respondents had positive attitudes and behaviors. Variables influencing sanitation knowledge, attitudes, and behaviors were educational level, age, gender, work experience, and amount of employee training. These researchers concluded that design of future training programs should allow employees to apply the new knowledge they learn in real life situations and work environments. It is recommended that managers of university foodservice conduct food safety training on a routine basis for both new employees and current employees and update new food safety knowledge and materials when those become available. Repeated training could improve employees' food safety knowledge, increase employees' positive attitudes toward food safety, and influence their food safety behaviors.

Henroid and Sneed (2004) evaluated food handling practices, presence of prerequisite food safety programs, and employees' food safety knowledge and attitudes in 40 Iowa school foodservice operations to determine readiness for implementing hazard analysis critical control point (HACCP) programs in school foodservice operations. These researchers found that employees had high food safety knowledge (15.9 ± 2.4 out of 20 points) and overall positive food safety attitudes (ranging from 4.2 to 4.8 out of 5 points). However, observations of food handling practices indicated that proper food handling practices sometimes were not followed. Areas identified for improvement included inadequate taking and recording of food temperatures, infrequent and improper handwashing, inappropriate food cooling and thawing, and inadequate checking and recording of sanitizer concentrations.

In a study of food safety practices and readiness to implement HACCP programs in assisted-living facilities in Iowa, Sneed, Strohbahn and Gilmore (2004) identified a number of food safety practice concerns. These researchers found that employees were least

knowledgeable about food cooling and thawing practices, sanitizer concentration, and minimum end-point cooking temperatures. Researchers observed that handwashing sometimes was inappropriate, effective hair restraints often were not used, food temperature monitoring and recording were infrequent, and sanitizer concentration was not checked regularly. Researchers concluded that employees in assisted-living foodservice had sufficient food safety knowledge and positive attitudes toward food safety, but food safety practices still needed to improve, which was consistent with findings in the Henroid and Sneed study (2004).

Previous research studies have focused on full-time employees' food safety knowledge, attitudes, and practices in restaurants, temporary food facilities, and institutional foodservices with little research has focused on student employees. The purpose of this study was to assess foodservice employees' food safety knowledge, attitudes, practices, and training at one Midwestern university and determine if there were differences in these variables between student and full-time employees.

METHODOLOGY

Subjects

A convenience sample of all student (N=547) and full-time (N=91) employees working in six residence dining centers at the university in Spring 2003 was used for the study. The research protocol and questionnaires were approved by the university Human Subjects Research Office prior to data collection. Approval of the project also was obtained from the director and assistant director of Dining Services.

Questionnaire Design

A 5-part questionnaire was developed to identify student and full-time employees' food safety knowledge, attitudes, practices, and the training received from Dining Services related to

food safety. Part one was designed to measure employees' knowledge related to food safety and included 10 multiple-choice questions. These questions were related to general food safety knowledge such as personal hygiene, definition of foodborne illness, time and temperature control, cross contamination, glove use, and sanitizing. The Cronbach alpha reliability coefficient for the 10 knowledge items was 0.41. Part two of the questionnaire included 12 questions to determine employees' attitudes toward food safety. A 5-point Likert-type rating scale, ranging from one (1) "strongly disagree" to five (5) "strongly agree", was used. The Cronbach alpha reliability coefficient for the 12 attitude items was 0.83. Part three of the questionnaire consisted of 14 questions measuring employees' self-reported on-the-job food safety practices. A 3-point rating scale was used to indicate frequency of food safety practices: always; sometimes; and never. An option of "not applicable" was provided for each practice question. The Cronbach alpha reliability coefficient for the practice items was 0.72. Part four of the questionnaire was developed to identify food safety topics taught to employees during orientation or on-the-job training. This part consisted of 16 questions, and respondents answered these statements by checking yes or no. The Cronbach alpha reliability coefficient for the 16 training items was 0.87. The final section collected demographic characteristics of student and full-time employees.

Pilot Test

The questionnaire was pre-tested by 20 undergraduate students who work in foodservice but not ISU Dining Services. Three graduate students enrolled in the Research in Foodservice Operations course also were asked to complete the questionnaire and to identify concerns and suggestions. All suggestions were considered and used to revise the questionnaire before data collection.

Data Collection

The questionnaire and a cover letter were distributed to student employees before or after they had clocked out for a shift and placed under the time clock for student employees who were willing to participate in this study but were unable to be present at the time of distribution. The questionnaire and a cover letter were placed in full-time employees' mailboxes at the work place. Employees placed completed questionnaires in designated sealed boxes in the dining hall office.

Data Analyses

SPSS version 11.0 for Windows was used for all data analyses. Descriptive statistics including frequencies, means, and standard deviations were calculated for all variables as appropriate. Analysis of variance (ANOVA) was used to examine differences in food safety knowledge, attitudes, practices, and training between student and full-time employees. ANOVA and correlations assessed the relationship between student and full-time employees' demographic characteristics and the mean total scores for food safety knowledge, attitudes, and practices. Multiple linear regression was used to test relationships among employees' food safety knowledge, attitudes, practices, training, and demographic variables. A probability of equal to or less than 0.05 was considered significant.

RESULTS AND DISCUSSION

Demographic Information

Student employees returned 221 questionnaires for a 40% response rate. Thirty-eight questionnaires were completed by full-time employees for a 42% response rate. Demographic characteristics of student and full-time employees are presented in Table 1.

Table 1. Demographic Characteristics of Student (N = 221) and Full-Time Employees (N = 38)

Characteristic	<u>Student</u> n (%)		<u>Full-Time</u> n (%)
Age (years)		Age (years)	
18-19	105 (47.5%)	<30	9 (23.7%)
20-21	81 (36.7%)	31-50	15 (39.5%)
22-23	27 (12.2%)	51-65	12 (31.6%)
24-28	6 (2.7%)	>65	1 (2.6%)
Gender		Gender	
Female	135 (61.1%)	Female	34 (89.5%)
Male	86 (38.9%)	Male	4 (10.5%)
Country		Education level	
United States	207 (93.7%)	High school	15 (39.5%)
International	14 (6.3%)	Some college	16 (42.1%)
College status		Bachelor's degree	1 (2.6%)
Freshman	85 (38.5%)	Years worked in ISU Dining	
Sophomore	65 (29.4%)	≤5	18 (47.4%)
Junior	39 (17.6%)	6-15	12 (31.6%)
Senior	32 (14.5%)	16-25	6 (15.8%)
College major		≤26	1 (2.6%)
Liberal arts and sciences	71 (32.1%)	Number of food safety training sessions received	
Engineering	38 (17.2%)	0	0 (0%)
Business	32 (14.5%)	1-2	17 (44.7%)
Education	17 (7.7%)	3-4	5 (13.2%)
Design	15 (6.8%)	5-6	2 (5.3%)
Family and consumer Sciences	15 (6.8%)	>6	8 (21.1%)
Agriculture	9 (4.1%)	Food safety certification	
Undecided	6 (2.7%)	Yes	27 (71.1%)
Food science and human nutrition	5 (2.3%)	No	5 (13.2%)
Hotel, restaurant, and institution management	5 (2.3%)		

Table 1. (Continued)

Characteristic	<u>Student</u> n (%)
Position	
Student employee	188 (85.1%)
Student supervisor/leader	33 (14.9%)
Hours worked	
<10 hrs/wk	11 (5.0%)
10-15 hrs/wk	144 (65.2%)
16-20 hrs/wk	61 (27.6%)
Semesters employed by ISU Dining	
1-2	144 (65.2%)
3-4	38 (17.2%)
5-6	24 (10.9%)
>6	13 (5.9%)
Number of on-the-job food safety training received	
0	30 (13.6%)
1-2	117 (52.9%)
3-4	40 (18.1%)
5-6	8 (3.6%)
>6	1 (0.5%)

Note. Percentages may not total 100% due to non-response to a question.

Knowledge Related to Food Safety

Food safety knowledge questions were grouped into six categories: personal hygiene, foodborne illnesses, time and temperature control, cross contamination, glove use, and sanitizing. Full-time employees had higher ($p \leq 0.001$) mean total scores for food safety knowledge than student employees. The frequency of correct responses for each food safety knowledge item for student and full-time employees is presented in Table 2.

Both student and full-time employees had a high number of correct responses when asked about the definition of foodborne illness (95.9% and 100%), cross contamination (94.1% and 97.4%), glove use (95.5% and 100%), and one of the questions about personal hygiene: “After washing their hands, employees should avoid touching their hair” (96.4% and 89.5%).

Approximately half (52.9%) of the student and one-third (29.9%) of full-time employees selected glove use over frequent handwashing when asked about the most important rule for personal hygiene; student employees had a lower correct score ($p \leq 0.001$) than full-time employees on this question. When asked about the temperature danger zone for potentially hazardous foods, there was a difference ($p \leq 0.001$) between student and full-time employees. About half (48.4%) of student employees answered the temperature danger zone question correctly while 78.9% of full-time employees answered it correctly. Full-time employees had higher ($p \leq 0.01$) scores than student employees on time and temperature control questions: “The most important factors to control the growth of bacteria are time and temperature” (94.7% and 70.1%, respectively), and “When holding hot foods for service, it is required that internal food temperatures be taken at least every two hours” (84.2% and 51.6%, respectively). A high percentage of full-time employees had completed a ServSafe® course and were certified in food safety.

Only 39.4% of student employees correctly answered the question about an appropriate method for thawing “Under running water that is 70°F or less is acceptable method for thawing frozen food”, which was lower ($p \leq 0.001$) than the percent of full-time employees who answered the question correctly. Less than half of student and full-time employees (43.4% and 42.1%, respectively) responded to the sanitizing question correctly. These results were consistent with the results of Sneed, Strohbehm, and Gilmore (2004) and Henroid and Sneed (2004). These researchers found that foodservice employees were least knowledgeable about sanitizer concentration and cooling and thawing practices. However, in this study some Dining Centers used high temperature dishwashing machines for washing, cleaning, and sanitizing items, therefore, employees may not be required to know about the concentration of sanitizing solutions.

Table 2. Comparison of the Number of Correct Responses for Each Food Safety Knowledge Item for Student (N = 221) and Full-Time (N = 38) Employees

Knowledge Items	Student		Full-Time		Sig.
	n	%	n	%	
<u>Personal hygiene</u>					
After washing their hands, employees should avoid touching their hair.	213	96.4%	34	89.5%	0.153
The most important rule of foodservice personal hygiene is that employees must wash their hands often.	104	47.1%	27	71.1%	0.001***
<u>Definition of foodborne illness</u>					
Foodborne illnesses are diseases that are carried or transmitted to people by food.	212	95.9%	38	100%	0.266

Table 2. (Continued)

Knowledge Items	Student		Full-Time		Sig.
	n	%	n	%	
<u>Time and temperature control</u>	155	70.1%	36	94.7%	0.002**
The most important factors to control the growth of bacteria are temperature and time.					
When holding hot foods for service, it is required that internal food temperatures be taken at least every two hours.	114	51.6%	32	84.2%	0.000***
The temperature danger zone for potentially hazardous foods is 41° to 140°F.	107	48.4%	30	78.9%	0.000***
Under running water that is 70°F or less is an acceptable method for thawing frozen food.	87	39.4%	33	86.8%	0.000***
<u>Cross contamination</u>					
Cross contamination is the transfer of harmful substances or micro-organisms to food from food or from a nonfood-contact surface, such as equipment, utensils, or hands.	208	94.1%	37	97.4%	0.47
Rita wore disposable gloves while she formed raw ground beef into patties. After she was finished, she wore the same gloves to slice smoked turkey breast for sandwich. What mistake did Rita make? She failed to change her gloves and wash her hands after handling raw meat and before handling a ready-to-eat food item	211	95.5%	38	100%	0.21
<u>Sanitizing</u>					
When iodine solutions (such as Mikrokylene) are used for sanitizing, the item must be immersed in the solution for 30 seconds.	96	43.4%	16	42.1%	0.85

** $p \leq 0.01$

*** $p \leq 0.001$

Attitudes and Practices Related to Food Safety

Full-time employees had higher ($p \leq 0.001$) mean total scores for food safety attitudes and practices than student employees. Table 3 shows the means and standard deviations for responses to attitudinal statements for student and full-time employees. For the 12 attitudinal statements, there were 11 statements for which student employees had lower scores ($p \leq 0.05$) than full-time employees. Responses to one statement, “I believe that good employee hygiene can prevent foodborne illness” was the same for both groups. Both student and full-time employees were neutral that food safety knowledge would make them more confident about their work.

Full-time employees had higher scores than student employees on 8 of 14 self-reported practice statements ($p \leq 0.05$) (Table 4). Both student and full-time employees had the lowest frequency of practice on checking concentrations of sanitizing solutions (2.1 and 2.5, respectively). This finding was similar to results of studies by Sneed, Strohbahn, and Gilmore (2004) and Henroid and Sneed (2004). These researchers observed sanitizer concentrations were not checked and recorded regularly by employees in assisted-living facilities and school foodservice operations. However, student and full-time employees in some Dining Centers may not be required to check sanitizer concentrations due to using high temperature dishwashing machines in these facilities.

Table 3. Comparison of Mean Food Safety Attitude Scores of Student (N = 221) and Full-Time (N = 38) Employees

Attitude Items	Student		Full-Time		F	Sig.
	Mean ^a	SD	Mean ^a	SD		
I think sanitation is an important part of my job responsibilities.	4.6	0.7	4.8	0.4	5.6	0.019*
I believe that good employee hygiene can prevent foodborne illness.	4.4	0.7	4.6	0.6	1.8	0.187
I think that it is the responsibility of all food handlers to ensure that food is safe to serve.	4.4	0.6	4.8	0.4	16.5	0.000***
I am willing to change my food handling behaviors when I know they are incorrect.	4.3	0.7	4.7	0.5	10.4	0.001***
I am willing to obtain more food safety knowledge.	4.0	0.7	4.6	0.6	20.7	0.000***
It is more important to have tasty food rather than safe food. ^b	4.0	0.9	4.7	0.6	22.7	0.000***
I select a place to eat based on its reputation for good sanitation and cleanliness.	3.9	0.8	4.4	0.6	16.3	0.000***
I think that managers should educate employees on personal hygiene and sanitation regularly.	3.9	0.9	4.3	0.7	10.4	0.001***
I think that only full-time employees should receive food safety training. ^b	3.7	1.1	4.5	0.7	19.6	0.000***
I believe that food safety knowledge not only benefits my work but also my personal life.	3.7	0.9	4.4	0.7	21.6	0.000***
I am willing to attend a food safety training course.	3.5	1.0	4.4	0.8	26.3	0.000***
I believe that food safety knowledge would make me more confident about my work.	3.5	0.9	4.2	0.7	20.8	0.000***

^a The scale for item scores ranged from strongly disagree (1) to strongly agree (5).

^b Item was reverse scored.

* $p \leq 0.05$

*** $p \leq 0.001$

Table 4. Comparison of Mean Food Safety Practice Scores of Student (N = 221) and Full-Time (N = 38) Employees

Practice Items	Student		Full-Time		F	Sig.
	Mean ^a	SD	Mean ^a	SD		
I use gloves or utensils to handle food that is ready-to-eat.	2.9	0.4	3.0	0.2	0.3	0.559
I use a separate clean utensil for each food item.	2.8	0.6	3.0	0.2	4.0	0.047*
I wash my hands vigorously with soap and water before working with food.	2.8	0.5	3.0	0.2	6.1	0.014*
I wash raw produce before using it.	2.8	0.5	2.9	0.4	1.1	0.302
I store chemicals in a non-food storage room.	2.8	0.5	2.8	0.6	0.0	0.877
I store raw food items in an area separate from cooked food.	2.8	0.4	2.9	0.2	2.7	0.106
I wear a clean uniform, when I work in foodservice.	2.7	0.5	3.0	0.0	12.0	0.001***
I wear a hair restraint (cap or hairnet), when I work in foodservice.	2.6	0.5	3.0	0.2	14.9	0.000***
I wash my hands and change into a new pair of gloves after touching anything that may contaminate my hands, when I prepare or serve food.	2.6	0.7	3.0	0.2	8.8	0.003**
I drink or eat food while I am serving or preparing food. ^b	2.5	0.6	2.7	0.5	0.1	0.829
I clean and sanitize work surfaces after each task.	2.5	0.7	2.7	0.5	1.6	0.204
When I am in doubt about the safety of a previously cooked food, I report it to the supervisor.	2.2	1.0	2.9	0.3	15.0	0.000***
I pay attention to expiration dates on foods and do not use foods that have passed the expiration date.	2.2	1.2	2.9	0.3	13.2	0.000***
I check concentrations of sanitizing solutions used for sanitizing work surfaces or items washed in the pot and pan sink.	2.1	0.8	2.5	0.6	5.7	0.018*

^a The scale for responses was never (1), sometimes (2), and always (3).

^b Item was reverse scored.

* $p \leq 0.05$

** $p \leq 0.01$

*** $p \leq 0.00$

Training Components Related to Food Safety

Student and full-time employees were asked to indicate what food safety components had been included in training that they have received while employed at Dining Services. Full-time employees had higher ($p \leq 0.001$) mean total scores for food safety training than student employees. Full-time employees reported more training on 11 of 16 food safety topics ($p \leq 0.05$) than student employees. All full-time employees reported that they had received the food safety component “Preventing cross contamination”; however, only 61% of student employees indicated that they have received it. The majority (92.1%) of full-time employees also reported that they had received information about “Temperature danger zone where microorganisms can grow rapidly”, but only about half (52.1%) of student employees reported they had received it.

Impact of Employees’ Demographic Characteristics on Food Safety Knowledge, Attitudes, and Practices

As student employees’ age increased, food safety attitude and practice scores increased ($r = .168$; $P < .013$ and $r = .152$; $P < .025$). When hours worked increased, practice scores increased ($r = .136$; $P < .046$). Also, as semesters employed by Dining Services increased, knowledge and practice scores increased ($r = .163$; $P < .016$ and $r = .154$; $P < .022$). In contrast, Cushman, Shanklin, and Niehoff (2001) found a negative correlation between personal hygiene practices and length of employment in the facility of the organization.

Significant differences were found between students who worked as regular student employees and those who worked as student supervisors or leaders. Results showed student supervisors or leaders had higher ($p \leq 0.05$) attitude and practice scores than did regular students. Student employees’ study area, gender, country, and college status did not affect food safety knowledge, attitudes, and practices.

Full-time employees' food safety knowledge and attitudes were related ($p \leq 0.05$) only to food safety certification. Full-time employees with food safety certification had higher knowledge and attitude scores than full-time employees without food safety certification. Hsu and Huang (1995) also reported that university foodservice employees who attended sanitation training programs had more positive sanitation behaviors. Sneed, Strohbehn, and Gilmore (2004) and Henroid and Sneed (2004) found that foodservice employees with food safety certification had higher knowledge than those employees who were not certified.

Factors Impacting Food Safety Practices

Four multiple linear regression models were used to test relationships among student employees' food safety knowledge, attitudes, practices, training, and demographic variables. The first model included student employees' food safety knowledge, attitude, and training scores as independent variables and food safety practices score as the dependent variable. The model was significant ($F = 29.68$, $p = 0.000$), and attitudes ($\beta = 0.40$, $p = 0.000$) and training ($\beta = 0.30$, $p = 0.000$) both had an independent influence on practices. The percentage of explained variance (R^2) for the model was 0.29.

The second model included student employees' food safety knowledge, attitudes, training scores, and four demographic variables: age, hours of worked in Dining Services per week, semesters employed by Dining Services, and position as independent variables and student employees' food safety practices score as the dependent variable. These four demographic variables were the only significant demographic variables identified using ANOVA comparison or correlation. The model was significant ($F = 13.08$, $p = 0.000$), and attitudes ($\beta = 0.39$, $p = 0.000$) and training ($\beta = 0.30$, $p = 0.000$) both had an independent influence on practice scores. However, no demographic variables were significant predictors for food safety practice score.

The percentage of explained variance (R^2) for this model was 0.31, which was little improvement over the model without the demographic variables.

The third model included student employees' food safety attitude, practice, and training scores, and four demographic variables as independent variables and student employees' food safety knowledge as the dependent variable. This model was significant ($F = 2.09$, $p = 0.046$). However, only age of student employees ($\beta = -0.18$, $p = .036$) and number of semesters employed by Dining Services ($\beta = 0.27$, $p = 0.01$) had an independent influence on food safety knowledge. Surprisingly, food safety attitudes and training did not have a significant influence on food safety knowledge. The percentage of explained variance (R^2) for the model was very low (0.07).

The fourth model testing the contribution of student employees' food safety knowledge, practice, and training scores, and four demographic variables in explaining student employees' food safety attitudes was significant ($F = 9.00$, $p = 0.000$). Food safety practices ($\beta = 0.43$, $p = 0.000$), age of student employees ($\beta = 0.21$, $p = 0.009$), and number of semesters employed by Dining Services ($\beta = -0.22$, $p = 0.018$) had an independent influence on food safety attitudes. The percentage of explained variance (R^2) for the model was 0.23.

Four multiple linear regression models also were conducted to test relationships among full-time employees' total scores for food safety knowledge, attitudes, practices, training, and demographic variables. None of these models was significant.

Conclusions and Recommendations

The key finding for this research was that there were significant differences in food safety knowledge, attitudes, practices, and training between student and full-time employees in university foodservice. Furthermore, student employees' food safety attitudes and training had a

significant positive influence on food safety practices. Results showed that student employees lacked knowledge and training related to proper handwashing procedures, time and temperature control, cross contamination, and sanitizer concentration.

Recommendations for managers in college and university foodservice, based on results of this study, include:

- ◆ Use the instrument developed for this study to conduct a self-assessment of training needs related to food safety.
- ◆ Implement an efficient food safety training program for student employees in to ensure student employees have appropriate levels of food safety knowledge and positive attitudes, and demonstrate these in practice.
- ◆ Consider providing food safety training not only during student employee orientation, which usually is held at the beginning of the semester, but also in the middle of semester as a reminder to student employees.
- ◆ Develop a checklist to ensure all food safety components are covered during food safety orientation and training.
- ◆ Consider use of a food safety training program delivered by CD-ROM. That method is flexible, cost-effective, and easy to use; and it will ensure student employees receive a consistent message.

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**Students' Perceived Service Quality and Customer Satisfaction in a
Midwestern University Foodservice Operation**

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Students' Perceived Service Quality and Customer Satisfaction in a Midwestern University Foodservice Operation

Abstract

This study explored the measurement of perceived service quality and satisfaction in a university foodservice setting. An instrument was used to measure the expectations, perceptions, and satisfaction levels of students who purchased meal plans from the university's Housing and Dining Services. Results of face-to-face interviews and a pilot test were used to refine the modified SERVQUAL instrument. Cronbach's Alphas for the scales in the final instrument were 0.96, 0.96, and 0.89 for expectations, perceptions, and satisfaction scales, respectively. A positive linear relationship was found between perceptions and satisfaction ($F=188.98, p=0.000$). As perceptions on tangibles ($p = 0.000$), food ($p = 0.000$), and reliability ($p = 0.038$) increased, the level of customer satisfaction also increased.

Key words: perceptions, expectations, perceived service quality, satisfaction

INTRODUCTION

In recent years, college and university foodservices have experienced many changes that have affected management styles, board plans, payment methods, menu concepts, and service styles. These changes are in response to the demands of a customer base that is diverse in demographic characteristics, such as age, cultural background, life and educational experience, and eating habits (Bowman, McProud, Usiewicz, Gendreau, & Mitchler, 1995; Chi & Brown, 1996; Tayce, Gassenheimer, & Ingram, 1999).

Customers in college foodservice operations want maximum choice with wide variety, flexibility and customization, and fresh-prepared food (Buzalka, 2003; Law, 2004).

Foodservice managers must be knowledgeable of expectations and perceptions of current students that affect their satisfaction with services provided.

Hence, it is important for college and university foodservice providers to measure perceived service quality and satisfaction as distinct, but related constructs. According to Asubonteng, McCleary, and Swan (1996), the multi-item SERVQUAL developed by Parasuraman, Zeithaml, and Berry (1985,1988,1991), is the most widely used instrument to measure expectations, perceptions, and the resulting gap. Two scales were developed to measure (1) the consumer's expectation of quality service from an ideal firm in an industry and (2) the consumer's perception of the service actually received from a specific firm in that industry.

Expectations involve the consumers' service quality requirements defined as what they feel a service provider *should* offer rather than *would* offer (Parasuraman et al., 1988). Literature has shown that expectations are important in determining satisfaction (Carman, 1990; Spreng & Mackoy, 1996). Customers have two levels of expectations: predictive or what *will* happen and normative or what *should* happen (Boulding, Kalra, Staelin, & Zeithaml, 1993; Stevens, Knutson, & Patton, 1995). Service providers need to discover what customers expect because satisfaction can be increased by decreasing expectations (Carman, 1990). Becker (2000) suggested that within the general population, expectations may not be homogenous across all students. Because these vary from one student to the next, it is desirable to analyze expectations at the individual level.

Boulding et al. (1993) concluded that perceptions result from a combination of (1) predictive and normative expectations and (2) the reality of the service encounter. It is the evaluation of the operation's performance in comparison to a food service quality standard that a student holds. The resulting gap, or perceived service quality, is "a global judgment, or attitude, relating to the superiority of the service" (Parasuraman et al., 1988, p. 16). Knowing the gap between expectations and perceptions can assist foodservice managers in benchmarking their performance and making changes needed to increase satisfaction.

Satisfaction, as discussed by Oliver (1989), involves "an evaluative, affective, or emotional response" (p.1). In his book, Oliver (1997) provided a definition that he thought was consistent with theoretical and empirical evidence available to him at the time. He defined satisfaction/dissatisfaction as "the consumer's fulfillment response, the degree to which the level of fulfillment is pleasant or unpleasant" (p.28). Therefore,

satisfaction is the customer's overall judgment of the service provider (McDougall & Levesque, 2000). Crompton and MacKay (1989) stated, "Satisfaction is a psychological outcome emerging from an experience, whereas service quality is concerned with the attributes of the service itself" (p. 368).

Oliver (1997) defined disconfirmation as the difference between the customer's expectations of performance and the actual perceived performance of the service. He stated that satisfaction is determined by disconfirmation. If the performance is less than what the customers expect, quality is perceived to be low resulting in negative disconfirmation or dissatisfaction. Conversely, if performance meets or exceeds customer's expectations quality is perceived to be high, resulting in positive disconfirmation or satisfaction (Bitner, 1990; Kandampully, Mok, & Sparks, 2001).

Of the numerous studies that have applied modified SERVQUAL models, few have been specifically for foodservice. Two of these are Dineserv (Stevens et al., 1995), which measured service quality in its entirety, and TANGSERV (Raajpoot, 2002), which focused on measuring only the tangible dimension. Dineserv adopted the five factor structure of SERVQUAL: tangibles, reliability, responsiveness, assurance, and empathy. The TANGSERV instrument included a three-factor structure for Tangibles: layout/design, product/service, and ambiance/social. Items used in these two scales were considered in the development of the instrument used in this study.

Application of the SERVQUAL to college and university foodservice operations is currently lacking. This study investigated the evaluation of students' perceived service quality and customer satisfaction with the foodservice operation in a Midwestern university. The study used a valid and reliable online instrument (Estepa, 2004) to

measure students' perception of service quality and satisfaction in a college and university foodservice setting. The study also investigated whether a linear relationship between the student's perception of service quality and their overall satisfaction rating existed.

METHODOLOGY

Because the study involved gathering data from human subjects, an approval from the Committee for Research Involving Human Subjects (IRB) was obtained prior to the face-to-face interviews, pilot study, and survey administration. Data were collected from a sample of university students participating in a meal plan of a Midwestern university's Housing and Dining Services. Students are housed in four residence halls, located adjacent to the dining center. The sample was composed of a total of 1626 students that included U.S. citizens or permanent residents and international students who were enrolled in both undergraduate and graduate programs. The majority of whom were freshmen.

Data were collected in two stages. Qualitative data were gathered from face-to-face interviews that were conducted from February 21 to March 12, 2004. Quantitative measurements were pilot tested and collected using a web-based survey. The instrument was pilot tested between February 29 to March 6, 2004. After refinement, data were collected from March 10 to March 19, 2004. Additional qualitative data were obtained from responses to the open-ended questions included in the instrument. For a detailed description of the instrument development and data collection process, please refer to *Developing a web-based multiple-item scale for measuring perceived service quality and satisfaction in the university foodservice setting* (Estepa, 2004).

An email was sent to the 1626 students introducing the study, the purpose, and the link to the survey. Each student was able to access the survey site only once because each link was unique. Students were also given a separate link if they chose to opt-out of the study completely. A total of four follow-up emails were sent after initial contact. Consent of participation was automatic with the completion of the survey. The survey software recorded the responses in a downloadable database format that did not include specific identification of the respondent, thus allowing for full confidentiality.

The survey was composed of three primary scales to measure the students' expectations, perceptions, and satisfaction. The expectation scale included 21 attributes that the students expect from any dining center, while the perception scale asked the respondents to evaluate the performance of the specific Midwestern foodservice operation on the same set of attributes. The three-item satisfaction scale measured the students' overall satisfaction with the services that they receive from the facility. All scales used a 7-point Likert scale ranging from 1, strongly disagree, through 7, strongly agree.

The instrument also included a section for the students to rank the importance of the five SERVQUAL (Parasuraman et al., 1988, 1991) dimensions in their evaluation of service quality. The demographics section included questions such as age, gender, length of stay in the residence halls, and university classification. The survey concluded with an open-ended question that provided the respondents an opportunity to indicate their comments or suggestions regarding their dining experiences at the facility.

All statistical procedures were done using the Statistical Package for Social Science (SPSS, 11.5, Chicago, IL). Descriptive statistics were used to summarize means

and standard deviations. Perception minus expectation gap scores per attribute and dimension were calculated and interpreted. Multiple regression was conducted with the perception scores as the independent variable and the total satisfaction score as the dependent variable to test for a relationship between these variables.

RESULTS AND DISCUSSION

Sample

Although 270 students accessed the site, only a total of 187 completed responses was obtained for a usable response rate of 11.5%. The growing number of unsolicited mail in the form of junk, spam, or bulk mail may be a reason that response rates are not necessarily high using this method (Sheehan, 2001). The recent rampage of computer viruses spread through email further wards the prospective user from opening any links or attachments (Sheehan, 2001). In addition, Sheehan (2001) states that response rates for all types of surveys are declining as a result of the general population being requested to complete more and more surveys.

Based on information from the university's dining services, the demographics of the sample used for analysis was reflective of the actual characteristics of students (B. Burgess, personal communication, November 5, 2003 and February 6, 2004). The majority of the respondents were freshmen, predominantly female, with a mean age of 19. The majority had lived in the residence hall for two semesters (61.5%). The most common meal plan purchased was the 15 meals per week (47.1%). Table 1 provides a summary of the demographic information.

Table 1. Demographic Characteristics of Respondents.

Demographic Characteristic		N	%
Gender			
	Male	44	23.5
	Female	143	76.5
Classification			
	Freshman	120	64.2
	Sophomore	33	17.6
	Junior	22	11.8
	Senior	11	5.9
	Graduate Student	1	0.5
Length of stay in Residence Hall			
	1 semester	31	16.6
	2 semesters	115	61.5
	3 semesters	4	2.1
	4 semesters	21	11.2
	5 or more semesters	16	8.6
Meal Plan			
	10	38	20.3
	15	88	47.1
	20	60	32.1
	No answer	1	0.5

Expectations and Perceptions

Through factor analysis, the 21 service quality attributes were categorized according to the extracted dimensions of Tangibles, Reliability, Customer Relations, and Food (Estepa, 2004). Table 2 shows the means and standard deviations for the 17 expectation and perception items retained for analysis.

Table 2. Perception, Expectation, and Gap Scores for Each Item and Each Extracted Dimension^a

Dimensions	Perceptions Mean ± SD	Expectations Mean ± SD	Gap
Dimension 1: Tangibles^b	4.69 ± 1.24	5.20 ± 1.35	-0.51
Employees of _____ dining center are neat and appropriately dressed.	5.43 ± 1.27	5.72 ± 1.23	-0.29
The service and dining areas at _____ dining center are thoroughly clean.	5.12 ± 1.40	5.72 ± 1.49	-0.60
Customers can be confident that safe food practices are followed in the preparation and service of food.	4.88 ± 1.61	5.45 ± 1.75	-0.58
_____ dining center has visually appealing serving and dining areas.	4.71 ± 1.51	5.20 ± 1.48	-0.49
The food presentation at _____ dining center is appealing.	4.47 ± 1.59	4.87 ± 1.72	-0.40
Employees of _____ dining center can answer questions about the menu, ingredients, and methods of preparation.	4.35 ± 1.60	4.78 ± 1.60	-0.42
_____ dining center has operating hours convenient to all their customers.	3.85 ± 2.01	4.68 ± 2.11	-0.82
Dimension 2: Reliability	5.30 ± 1.31	5.70 ± 1.20	-0.40
_____ dining center provides their services at the time they promise to do so.	5.51 ± 1.41	5.87 ± 1.23	-0.36
_____ dining center effectively communicates service hours.	5.46 ± 1.61	5.68 ± 1.59	-0.22
_____ dining center is consistent and reliable.	5.29 ± 1.59	5.65 ± 1.40	-0.36
_____ dining center performs the service right the first time.	5.27 ± 1.40	5.73 ± 1.23	-0.46

At _____ dining center, items on the printed menus are available throughout the service period.	5.01 ± 1.57	5.57 ± 1.56	-0.56
Dimension 3: Customer Relations	5.08 ± 1.30	5.46 ± 1.29	-0.38
Employees of _____ dining center are willing to help customers.	5.25 ± 1.42	5.73 ± 1.39	-0.48
Employees of _____ dining center are courteous with customers.	5.25 ± 1.41	5.59 ± 1.40	-0.34
_____ dining center gives customers individual attention.	4.74 ± 1.45	5.06 ± 1.48	-0.32
Dimension 4: Food	4.67 ± 1.64	5.17 ± 1.64	-0.50
_____ dining center offers a variety of food choices.	5.02 ± 1.77	5.52 ± 1.70	-0.50
The portion sizes offered at _____ dining center are appropriate.	4.32 ± 1.87	4.82 ± 1.93	-0.50

^a A 7-point Likert scale ranging from 1, strongly disagree to 7, strongly agree was used.

^b Dimension mean score = (Σ item scores) / number of items in dimension

The range for perceptions scores was from a low of 3.85 ± 2.01 to a high of 5.51 ± 1.41 on a 7 point scale ranging from 1, strongly disagree to 7, strongly agree. Data show that on average, the dining center performed best in reliability ($M \pm SD = 5.3 \pm 1.31$) and poorest in the food dimensions ($M \pm SD = 4.67 \pm 1.64$). The dining center performed well in the following attributes: providing their services when they were promised ($M \pm SD = 5.51 \pm 1.41$), effectively communicating the hours of operation ($M \pm SD = 5.46 \pm 1.61$), and appearance of the employees ($M \pm SD = 5.43 \pm 1.27$). Perception scores indicated that management needs to concentrate efforts on improving the students' perceptions in three key areas: (1) portion sizes that are available, (2) ability of employees to answer questions about the menu items, and (3) convenience of the operating hours that the dining hall has set. These findings are also reflective of sentiments expressed by the students in their responses to open-ended questions.

The range for expectations scores was from a low of 4.68 ± 2.11 to a high of 5.87 ± 1.23 . The students also have the greatest mean expectation for the reliability dimension ($M \pm SD = 5.70 \pm 1.20$). Although the food dimension had the lowest expectation score, the mean of 5.17 ± 1.64 on a 7-point scale, indicated that students have high normative expectations. Students had highest expectations for the attributes of services being available at the time that management has promised ($M \pm SD = 5.87 \pm 1.23$), employees who are willing to help customers ($M \pm SD = 5.73 \pm 1.39$), and service being performed right the first time ($M \pm SD = 5.73 \pm 1.23$). Students had the lowest expectations for employee knowledge of the menu items ($M \pm SD = 4.78 \pm 1.60$), portion sizes ($M \pm SD = 4.82 \pm 1.93$), and operating hours ($M \pm SD = 4.68 \pm 2.11$). The students

may not be able to compare the expectations for these attributes to other settings such as restaurants, wherein expectations for these attributes would be relatively high.

Perceived Service Quality

Parasuraman et al. (1994) suggested that the gap analysis is accurate in identifying service shortfalls in an operation. Addressing these identified shortfalls is a foundation for planning strategies to ensure customer experiences that are consistent with their expectations and thus increasing the probability of satisfaction (Kandampully et al., 2001). The data showed that in general, the students' perceptions of the service quality in the dining center did not meet their expectations (Table 2). This is evidenced by all the perception minus expectation gap scores being negative, ranging from -0.22 to -0.82 .

Although the students had low expectations about the convenience of the operating hours, portion sizes, and the knowledge of employees, these attributes had the widest gaps. This implied that having low expectations about an attribute does not necessarily suggest that those expectations are easily met or that the respondents are not as critical in evaluating performance on these attributes. On the other hand, the smallest gaps existed with the employees' appearance, ability to provide individual attention, and the effectiveness in communicating service hours. This suggests that these attributes are three of the facility's strongest points.

In general, the largest mean gaps were for the tangible (-0.51) and food (-0.50) dimensions. Management should consider concentrating on these shortfalls and improving the attributes under each dimension. On the other hand, the smallest mean gap was with the customer relations (-0.38) dimension, indicating that the staff is perceived to be generally courteous, willing to help customers, and give individual attention. The

reliability dimension was not much different at -0.40 , indicating that the dining hall is perceived to be relatively reliable and consistent. However, because these gaps were negative, improvement is still desirable to increase the operation's capacity to meet the students' expectations.

Student Satisfaction

Table 3 shows the customer satisfaction evaluation of the services offered by the dining center. The results indicated that the students were more satisfied with the service that they received from the employees of the dining center in comparison to the quality and variety of food offered. Although they are not necessarily dissatisfied, the data showed that overall satisfaction level of students was relatively low on a 7-point scale. The scores on the three items also suggested that students' satisfaction with overall dining experience can be attributed to their satisfaction with the employees.

Table 3. Customer Satisfaction Scores^a

Statement	Mean \pm SD
I am satisfied with the service that I receive from employees at _____ dining center.	5.26 \pm 1.473
I am satisfied with the quality and variety of food offered at _____ dining center.	4.30 \pm 1.871
Overall, I am satisfied with the dining experience at _____ dining center.	4.82 \pm 1.632

^aEvaluation was made on a 7-point Likert scale ranging from 1, strongly disagree to 7, strongly agree.

Over the years, a focal point for services marketing research has been service quality and the role of its dimensions as a primary determinant of customer satisfaction (Brown et al., 1993; Parasuraman et al., 1988, 1994). Research shows that service quality and satisfaction are indeed distinct constructs (Fournier & Mick, 1999). McDougall and

Levesque (2000) further stated that though distinct constructs, service quality and satisfaction have a causal relationship.

Total satisfaction scores per respondent were calculated by summing all the satisfaction item scores. Similarly, factor scores per student were calculated by averaging all the perception scores for the attributes per dimension. Stepwise multiple regression (Table 4) was conducted with the factor scores as the independent variables and the total satisfaction score as the dependent variable to test for a relationship between these variables. Results showed that variance inflation factors (VIF's) were less than ten, indicating that multicollinearity between dimensions was not an issue in the model.

Table 4. Summary of Stepwise Regression for Dimensions Significant in Predicting Total Customer Satisfaction^a

Independent Variable	B	SE B	β	t value	Sig.
Tangibles	1.78	0.25	0.49	7.19	0.000*
Food	0.90	0.14	0.33	6.60	0.000*
Reliability	0.49	0.23	0.14	2.09	0.038*
<i>R²=0.76 Adjusted R²= 0.75 F= 188.98</i>					

* p<0.05

The tangibles, food, and reliability dimensions explained 76% of the variance in total satisfaction scores ($F=188.987, p=0.000$). Therefore, it is reasonable to conclude that as perception ratings increase, customer satisfaction also increases. Results of the regression imply that improving the attributes that compose these dimensions will have the greatest impact on increasing customer satisfaction scores. Notably, the two dimensions with the greatest effect, tangibles and food, are also the dimensions for which the dining hall received the poorest mean perception ratings. This again stresses management's need to focus immediate attention on these dimensions. The foodservice

manager should take steps to evaluate operational procedures involved in delivering these attributes.

Other findings

Besides the quantitative measurements in the instrument, the students were also asked to provide any comments and suggestions for the operation. Additionally, the students were asked to enumerate any quality attributes that they use to evaluate their dining experience. Eight attributes were identified in the responses, namely: convenience and appropriate meal hours, variety of food choices, food quality attributes, availability of healthy options, efficient staff, value for the money, novelty, and ability to offer suggestions. This further supports the importance of measuring and benchmarking perceived service quality and customer satisfaction in this segment.

Conclusion and Applications

Meyer and Conklin (1998) suggested that successful school foodservice facilities give their student consumers a central role in the operations. Bojanic and Kashyap (2000) agreed that a customer-oriented approach is vital in the marketing concept. As implied by these authors, the study found that focusing on the customer can provide the foodservice manager an opportunity to identify important product and service attributes that affect customer perceptions of value and satisfaction. The study showed that as perceptions of service quality attributes increase, the level of customer satisfaction also increases. Hence, this emphasizes the need for management to monitor and constantly work to improve performance on the different attributes.

Applications

The evaluation of service quality and satisfaction involves many aspects simply because it is a human behavioral measurement. These expectations and perceptions vary from one student to another, from one semester to the next. Further research can focus on factors that cause the variances in these evaluations. Demographic factors such as gender, age, or cultural background may be areas of interest, especially in more diverse populations than the one studied in this research.

The expectations scale and demographics portion can be administered at the beginning of the semester to establish a benchmark for the foodservice manager. At the end of the semester, a matched survey can be administered to measure the performance of the facility. Reducing the length of the questionnaire may also encourage response rates to increase. Separate administrations could also minimize the effect of the students' familiarity on their expectation ratings.

Foodservice managers can use this instrument as a baseline for a longitudinal benchmarking program. Having a baseline will give foodservice managers a means of comparing their performance from semester to semester or from year to year. Foodservice managers can use the data to determine if they are performing well, mediocre, or poorly in the specific aspects of the service experience. It is much easier to improve services if management knows what needs to be improved. Having this information will help managers allocate funds or resources towards areas that most need improvement. Furthermore, data can be used to track fluctuations in expectations and resulting perceptions of changes that management may decide to implement.

This information can also be used to develop employee-training programs to deal with service shortfalls identified in the operation. As results of this study have shown, satisfaction with employees contributes significantly to the overall customer satisfaction. Management should emphasize the need for employees to be knowledgeable of the food served. One way to do this is to have service staff take part in a taste panel where a supervisor will allow them to try menu items and explain cooking method, ingredients, and other pertinent information. Whether employees work in the back of the house or the frontline, their roles in the operation are central to the success of the facility.

Recommendations were submitted to the study site based on feedback from the students. Key suggestions included extending the availability of the service by having the grab-and-go option open throughout the day and adjusting meal hours to accommodate the students' more active lifestyles. Though unlimited portion sizes may initially affect the bottom line and food cost, it seems to be a popular demand among the students.

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Status of Prerequisite and HACCP Programs Implementation:

College and University Foodservice

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**Status of Prerequisite and HACCP Programs Implementation:
College and University Foodservice**

Abstract

The objectives of this research were to determine the status of prerequisite and HACCP programs implemented in college and university foodservices and to identify barriers to implementation. Survey results revealed that thermometers in freezers, procedures for chemical storage, and policies for handwashing were the three most implemented prerequisites, that 73% of managers are interested in implementing HACCP, and lack of or time for employee training was the greatest barrier to HACCP implementation. Recommendations include developing foodservice specific HACCP training materials and providing more HACCP and food safety training opportunities for employees.

Keywords: HACCP, foodservice, barriers

**Status of Prerequisite and HACCP Program Implementation:
College and University Foodservice**

INTRODUCTION

The safety of food served in college and university foodservices should be of major concern to university officials, foodservice operators, parents, students, and the community. In a university setting, where thousands are served daily, a food safety outbreak could cause sickness or death of many students and the financial ramifications could be devastating (National Restaurant Association Educational Foundation, nd). University foodservice managers should control food safety using the best possible methods. However, little research has been published that examines HACCP implementation in college and university foodservices.

LITERATURE REVIEW

Research has been conducted on implementation of HACCP and prerequisite programs in restaurants (Almanza & Ghiselli, 1998; Roberts & Sneed, 2003) and school foodservices (Giampaoli, Sneed, Cluskey, & Koenig, 2002; Henriod & Sneed, 2004; Hwang, Almanza, & Nelson, 2001; Youn & Sneed, 2002, 2003). Roberts and Sneed found that of 131 restaurant managers surveyed; only 10 (7.6%) had HACCP programs in place. Additionally, less than half (43.9%) of the restaurants had an individual responsible for food safety, which has been found to be a significant factor in increasing the number of food safety programs implemented (Roberts & Sneed, 2003).

In school foodservice, Hwang et al. (2001) indicated that only 14% of their sample had HACCP programs in place. Of those who did not currently have a HACCP plan, only 28% had plans to implement HACCP in the near future, and 69% either did not know what HACCP was or had no plans of implementing a HACCP plan.

Several studies have identified barriers to HACCP implementation in foodservice. Time, money, and resources have been cited as management barriers, employee barriers identified included time and training (Barrett, Penner, & Blakeslee, 1996; Giampaoli et al., 2002; Hwang et al., 2001; Youn & Sneed, 2002, 2003).

The National Association of College and University Foodservices (NACUFS) encourages its member institutions to promote the highest standards of food safety and sanitation. Members are required to adhere to federal and state regulations and NACUFS recommends that a HACCP or similar food safety program be implemented (NACUFS, 1998). However, Sauer (1998) found evidence that suggested NACUFS foodservice directors felt only moderately knowledgeable about HACCP and were even less confident that HACCP would prevent a foodborne illness. Based on a five-point Likert scale, with one meaning no knowledge to five meaning full knowledge, foodservice directors rated their knowledge at a mean of 3.6 and rated the effectiveness of HACCP to prevent foodborne illness at a mean of 3.0.

In college and university foodservice, the decision to outsource foodservices has been driven by several trends including food safety programs, service bundling, investment, culinary influences, and technology. Moreover, contract management companies that can demonstrate effective HACCP programs have a clear advantage (Lawn & Buzalka, 1998).

The goals of this research were to determine the status of prerequisite and HACCP programs implemented in college and university foodservices, to identify potential barriers to

implementing prerequisite and HACCP programs, and determine if there were differences in implementation based on management structure. Research questions addressed by this study included:

1. What is the extent of prerequisite and HACCP program implementation?
2. What barriers to prerequisite and HACCP program implementation exist in college and university foodservice?
3. What is the level of perceived HACCP knowledge of NACUFS foodservice managers?
4. What is the level of perceived HACCP ability of NACUFS foodservice managers?
5. Do differences exist in prerequisite and HACCP program implementation based on the management structure (self-op vs. contract)?
6. Does number of meals served effect prerequisite and HACCP program implementation?
7. Does size of student population effect prerequisite and HACCP program implementation?

METHODOLOGY

Sample

A total of 677 college and university foodservice managers listed in the NACUFS Membership Directory (2002) were solicited to participate in this study. College and university foodservices included two- and four-year post-secondary schools.

Electronic mail (e-mail) was utilized to distribute the survey instrument (Cobanoglu, Warde, & Moreo, 2001; Dillman, 2000). E-mail selection was based on job title and included foodservice director, manager, or auxiliary contact. If the institution had multiple campuses, one e-mail was sent to the director at each campus.

Instrument

A modified version of the Roberts and Sneed (2003) and Sauer (1998) instruments were used in this study. Part I determined if any prerequisite or HACCP programs had been implemented, Part II determined barriers related to food safety, and Part III determined attitudes of food service managers. Parts IV and V explored HACCP knowledge level and ability of managers. Part VI contained demographic questions about the institution and manager.

A pilot test was conducted with college and university managers to assure questions were worded correctly and easily understood. Minor changes were made to the questionnaire based on responses from the pilot test. Pilot tests responses were not included in the final data analysis.

DATA COLLECTION AND ANALYSIS

An e-mail introducing the survey and its research goals was sent to 677 NACUFS member institution managers. E-mails contained a cover letter asking the managers to participate in the survey and a link was provided to the survey site. After initial mailing of the survey, reminder e-mails were sent once a week for two weeks.

The Statistical Package for the Social Sciences 11.5 was used to analyze data. Descriptive statistics including frequencies, means, and standard deviations were calculated. T-tests determined if there were differences in prerequisite and HACCP program implementation by management structure, student population, and meals served per day. A type I error level of .05 was considered significant in analyzing results.

RESULTS AND DISCUSSION

Of the original 677 e-mail addresses, 156 were returned undeliverable. Of those, correct e-mail addresses were located for 36 and resent. The remaining 120 addresses, utilizing online college and university directories, revealed that the individuals were no longer employed at the college or university. The adjusted sample size was 557, with 112 completed questionnaires

returned, resulting in a response rate of 20.1%. While this response rate is low, it is comparable to other studies that utilized NACUFS members as the sampling frame. Utilizing traditional paper surveys distributed by mail, Perdue and Woods (2000) reported a response rate of 27%, Horton and Schmidgal (2001) 15.3%, and Schmidgal and Haskell (2000) 21.8%. Additionally, email surveys are relatively new to NACUFS research, only one other study could be found that utilized email surveys with a NACUFS sampling frame. Sauer (1998) had a response rate of 27%.

Characteristics of College and University Foodservices and Managers

Analysis of the characteristics of foodservice facilities found that 49% of institutions had student populations less than 10,000 and 79% were self-operated. The majority (62.5%) of respondents were younger than 50 years old, 62% were male, 49% had 26 or more years of foodservice experience, and 79% were food safety certified. These findings are similar to the findings of Sauer (1998) where 52.6% had student populations less than 10,000, 88% were self-operated, and 57% of respondents were male.

This study indicated 28% of NACUFS managers had fully implemented a HACCP program. Sauer (1998) found that NACUFS directors were in various stages of HACCP implementation with 5.3% reporting that implementation was complete and 51.3% had partially implemented plans. Results indicate that HACCP implementation in college and university foodservices has increased.

Status of Prerequisite and HACCP Programs

This study explored 10 prerequisite programs identified by the National Advisory Committee on the Microbiological Criteria for Food (1998). These included: cleaning and sanitizing, chemical control, facilities, personal hygiene, pest control, production equipment,

receiving, storage and shipping, specifications, supplier control, and training. These areas were subdivided into 32 specific characteristics to measure implementation of prerequisite and HACCP programs.

The three prerequisite and HACCP programs most implemented were thermometers in refrigerators, thermometers in freezers, and routine spraying by a pest control operator (Table 1). The three least implemented prerequisite and HACCP programs equipment temperature calibration schedules, food product flow charts, and a HACCP team.

T-test results show significant differences existed between self-operated and contract-managed facilities in 23 of 32 variables. In each of these instances, contract-managed facilities had significantly higher means than the means of self-operated facilities (Table 1).

Barriers to Food Safety Program Implementation

In this study, training was identified as the top barrier, which is consistent with what has been found in the literature (Sauer, 1998; Barrett et al., 1996) (Table 2). Seventy-one percent of respondents agreed or strongly agreed that the most significant barrier was the lack of opportunities for in-house employee training followed by lack of opportunities for outside training with 83% agreeing or strongly agreeing. Respondents disagreed that food safety would improve if more money were devoted to it because 30% of respondents disagreed or strongly disagreed. T-tests determined that there were no significant differences among food safety barriers based on management structure (Table 2).

Food Safety Knowledge and Ability of Managers

Perceived knowledge of food safety and HACCP principles among managers is presented in Table 3. Two areas that managers reported being most knowledgeable about were factors of personal hygiene essential for employees to prevent foodborne illness and recognizing potential

food safety hazards and their severity in a foodservice operation. Managers reported being least knowledgeable about HACCP corrective actions and HACCP record keeping systems.

T-test results show food safety knowledge of foodservice managers were significantly different in five areas: critical control point requirements, monitoring critical control points, the HACCP system, corrective actions, and record keeping. Managers of contract-managed facilities had significantly higher means than managers of self-operated facilities (Table 3).

This study explored perceived abilities (Table 4) of foodservice managers to act on their knowledge of prerequisite and HACCP programs, because ability of the foodservice managers would have an influence on types of programs implemented. Perceived abilities with highest overall means were taking corrective actions and recognizing food safety hazards and assessing their severity. Perceived abilities with lowest overall means included training employees to implement a HACCP system and developing flow charts.

Contract-managed facilities had significantly higher means than those of self-operated facilities in two areas: taking corrective actions, recognizing food safety hazards and assessing their severity.

Interestingly, while 34% of manager's indicated that their level of knowledge about HACCP corrective actions was moderate or lower, 85% indicated that they had much to full ability to take corrective actions if a food safety violation occurs. This inconsistency may be due to foodservice manager's not having a clear understanding about HACCP.

Meals Served and Student Population

T-tests were conducted to determine if there were significant differences in prerequisite and HACCP implementation based on number of meals served or the institutions' student population. The only prerequisite program that was significantly different based on number of

meals served was procedures to assure potentially hazardous foods are put under refrigeration quickly upon receiving ($t = 2.12, p=0.037$); indicating that small operations (less than 2500 meals per day) implemented this characteristic more often than larger operations (more than 2500 meals per day). A reason for this could be that smaller operations have lower volume, resulting in delivers having small amounts of potentially hazardous foods and employees being able to refrigerate items quickly.

Two significant differences in prerequisite and HACCP implementation were found based on student population. Results showed that institutions with student populations less than 10,000 have a higher mean for routine pest control ($t=2.442, p=.018$); however, the reverse is true for preventative maintenance ($t=-2.217, p=.029$).

CONCLUSIONS

Even though NACMCF (1998) identified HACCP as a proactive program that could alleviate many food safety outbreaks, 72% of college and university foodservice managers have not fully implemented HACCP. Moreover, prerequisite programs necessary for HACCP implementation have not been initiated in many operations. The majority of the prerequisite programs are inexpensive and easy to implement, yet had not been done. Survey responses indicated that 73% of managers were interested in implementing HACCP, but have not taken time to ensure that prerequisite programs have been put into practice. Results also suggest that even though managers have knowledge of basic food safety principles, they lack specific knowledge about HACCP systems and its components.

As indicated, there is a significant difference in the extent to which prerequisite and HACCP programs have been implemented between self-operated and contract-managed facilities. Contract-managed facilities had higher means for all items where a significant

difference was found. In view of the fact that contract-managed facilities are part of larger organizations, they may have a HACCP plan developed at the corporate level, which can be adapted by individual units with only minor modifications needed. Self-operated facilities do not have this advantage; therefore it would be beneficial for NACUFS operators to band together and develop a HACCP plan that could be adapted by colleges and universities in order to eliminate this competitive edge. NACUFS would then be able to disseminate this information and offer support to member schools.

These results show that further training in food safety practices and HACCP are needed in self-operated facilities. Managers of self-operated facilities rated themselves as having less knowledge and ability than their counterparts. This may be due to contract management companies having extensive and ongoing training programs for their managers. Food safety training is essential for safe food production is a significant issue that should be addressed by NACUFS, who could offer training to employees about HACCP and implementation of a HACCP program.

Limitations to this study include the low response rate and ambiguity in self-reported data. These results should not be generalized for use outside the college and university setting. Further research is needed to identify knowledge, attitude, and behavioral barriers and effective training strategies for college and university foodservice personnel.

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Table 1. Status of Prerequisite and HACCP programs among Colleges and Universities, Self-operated versus Contract-managed

Characteristic ^a	Overall (n=112)		Self Operated (n=87)		Contract- Managed (n = 25)		t	Sig.
	Mean	± SD	Mean	± SD	Mean	± SD		
Thermometers in refrigerators	4.97	0.16	4.98	0.16	4.95	0.21	0.4336	0.6680
Thermometers in freezers	4.97	0.16	4.98	0.16	4.95	0.21	0.4336	0.6680
Routine spraying by a pest control operator	4.94	0.28	4.93	0.31	4.95	0.21	-0.5034	0.6170
A policy on handwashing	4.88	0.44	4.84	0.51	5.00	0.00	-2.8221	0.0060*
Procedures to check the final internal temperature of cooked food	4.84	0.45	4.79	0.51	5.00	0.00	-3.6460	0.0005*
A policy on the use of gloves	4.82	0.47	4.80	0.49	4.95	0.21	-2.2688	0.0260*
A policy on the use of hair restraints	4.80	0.62	4.78	0.63	4.82	0.66	-0.2226	0.8253
All employees trained on personal hygiene	4.79	0.45	4.76	0.49	4.86	0.35	-1.1673	0.2492
All employees trained on cleaning and sanitation procedures	4.76	0.45	4.71	0.48	4.95	0.21	-3.4934	0.0008*
Procedures to assure potentially hazardous foods are put under refrigeration quickly upon receiving	4.70	0.74	4.70	0.66	4.95	0.21	-3.0173	0.0032*
All employees trained on safe food handling practices	4.64	0.63	4.61	0.64	4.77	0.53	-1.2237	0.2283
Equipment that is certified by NSF, Inc.	4.53	1.08	4.49	1.11	4.82	0.66	-1.7609	0.0837
Written procedures for cleaning and sanitizing all equipment	4.39	0.83	4.26	0.89	4.77	0.43	-3.8570	0.0002*
Documented procedures for chemical storage	4.37	0.96	4.24	1.00	4.71	0.78	-2.3100	0.0263*
Traffic flow of food that minimizes cross contamination	4.31	0.91	4.18	0.96	4.73	0.46	-3.8030	0.0003*
Procedures for checking the internal temperature of foods while cooling	4.25	0.95	4.09	1.01	4.82	0.50	-4.7482	0.0000*
Written procedures for cleaning the operation	4.25	0.99	4.11	1.03	4.73	0.55	-3.7775	0.0003*
Temperature logs to record end-point cooking temperatures	4.16	1.10	4.06	1.17	4.55	0.67	-2.5143	0.0147*

Table 1. Status of Prerequisite and HACCP programs among Colleges and Universities, Self-operated versus Contract-managed (cont)

Characteristic ^a	Overall (n=112)		Self Operated (n=87)		Contract- Managed (n = 25)		t	Sig.
	Mean	± SD	Mean	± SD	Mean	± SD		
Assurance from suppliers that they follow HACCP or good manufacturing practices	4.11	1.19	3.93	1.21	4.73	0.88	-3.4735	0.0012*
Procedures to take and record the temperatures of all potentially hazardous foods as they flow through the operation	4.07	1.11	3.98	1.12	4.64	0.66	-3.5284	0.0008*
Preventive maintenance schedules	4.06	1.03	3.98	1.05	4.32	0.95	-1.4727	0.1495
Procedures to check temperatures when receiving food	4.06	1.04	3.94	1.06	4.55	0.80	-2.9321	0.0054*
Written specifications for all ingredients and food products	4.00	1.14	3.82	1.20	4.62	0.74	-3.8416	0.0003*
Temperature logs for all cooling equipment	3.94	1.20	3.77	1.25	4.55	0.74	-3.7112	0.0005*
Standardized recipes with critical control points	3.83	1.09	3.72	1.08	4.09	1.02	-1.4981	0.1431
Procedures for checking the condition of the supplier's delivery trucks (i.e. sanitation, temperature)	3.70	1.21	3.48	1.21	4.64	0.58	-6.3722	0.0000*
Thermometers in dry storage	3.62	1.30	3.45	1.31	4.14	1.17	-2.3824	0.0225*
A comprehensive Hazard Analysis Critical Control Point (HACCP) plan	3.57	1.19	3.33	1.17	4.43	0.75	-5.2946	0.0000*
Temperature logs for all heating equipment	3.53	1.34	3.30	1.36	4.41	0.85	-4.6810	0.0000*
Equipment temperature calibration schedules	3.53	1.28	3.32	1.28	4.14	1.13	-2.9450	0.0056*
Food product flow charts	3.39	1.15	3.26	1.13	3.91	1.11	-2.4423	0.0200*
A HACCP team	3.33	1.29	3.11	1.26	4.05	1.07	-3.4241	0.0016*

^a The statement "Please indicate the food safety practices that you have or plan to implement within your operation." was used for all items.

^b Likert scale: 1 = don't know, 2= no plans to implement, 3 = plan to implement, 4 = partially implemented, and 5 = fully implemented

* Indicated significance level of $\alpha < .05$

Table 2. Food Safety Barriers among College and University Foodservices in relation to HACCP and Prerequisite Programs (n=108)

Characteristic ^a	Mean \pm SD ^{bc}	Frequency of Responses (%) ^d				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Employees had training opportunities outside of operation.	4.0 \pm 0.92	26 (24%)	53 (49%)	19 (18%)	10 (9%)	0 (0%)
Employees had more opportunities for training at the operation conducted by a manager.	3.9 \pm 0.88	31 (29%)	55 (51%)	11 (10%)	10 (9%)	1 (1%)
Employees had more time to implement food safety practices.	3.8 \pm 1.09	17 (16%)	35 (32%)	27 (25%)	26 (24%)	3 (3%)
Employees were more motivated to implement food safety practices.	3.7 \pm 1.11	30 (28%)	45 (42%)	15 (14%)	15 (14%)	3 (3%)
We did not have high levels of turnover.	3.7 \pm 1.03	23 (21%)	40 (37%)	24 (22%)	17 (16%)	4 (4%)
Managers had more time to implement food safety practices.	3.6 \pm 1.01	28 (26%)	40 (37%)	20 (18%)	17 (16%)	3 (3%)
We could hire a consultant.	3.6 \pm 0.99	7 (7%)	25 (24%)	26 (24%)	37 (35%)	13 (12%)
We had a model HACCP plan to follow.	3.6 \pm 1.10	20 (19%)	47 (44%)	23 (21%)	16 (15%)	2 (2%)
Our facilities were designed differently.	3.5 \pm 1.07	20 (19%)	37 (35%)	31 (28%)	17 (16%)	3 (3%)
We had more money to devote to food safety.	3.3 \pm 1.10	17 (16%)	30 (29%)	30 (27%)	28 (27%)	3 (3%)
We documented food flow and temperatures.	3.3 \pm 1.12	18 (17%)	45 (42%)	30 (27%)	12 (11%)	3 (3%)
We could implement our HACCP program.	2.8 \pm 1.15	21 (20%)	47 (44%)	25 (23%)	11 (10%)	4 (4%)

^a The stem "Food safety in my operation would improve if. . ." was used for all questions

^b Mean \pm Standard Deviation

^c Likert scale: 1 = strongly disagree, 2= disagree, 3 = neutral, 4 = agree, and 5 = strongly agree

^d Percentages may not add to 100% due to rounding

Table 3. Food Safety Knowledge among College and University Foodservice Managers' (n=112)

Characteristic ^a	Overall (n=112)		Self Operated (n=87)		Contract-Managed (n=25)		t	Sig.
	Mean	±SD	Mean	±SD	Mean	±SD		
Factors of personal hygiene essential for employees to prevent foodborne illness.	4.53	0.60	4.48	0.63	4.73	0.46	-2.1092	0.0406*
Potential food safety hazards and their severity in a foodservice operation	4.31	0.65	3.82	0.85	4.05	0.84	-1.3001	0.2038
Environmental conditions that encourage growth of microorganisms	4.20	0.65	4.19	0.63	4.32	0.72	-0.7626	0.4517
Characteristics of potentially hazardous foods (PHF)	4.16	0.76	4.13	0.76	4.36	0.73	-1.3252	0.1939
Requirements that must be met at each critical control point	4.19	0.85	3.93	0.85	4.50	0.67	-3.3494	0.0018*
Procedures to monitor critical control points	3.99	0.85	3.90	0.84	4.43	0.75	-2.7988	0.0084*
The Hazard Analysis Critical Control Point System	3.85	0.92	3.82	0.85	4.05	0.84	-2.6564	0.0114*
Microorganisms that cause foodborne illness	3.94	0.69	3.90	0.65	4.14	0.83	-1.21	0.2364
HACCP corrective actions	3.77	1.01	3.63	1.00	4.36	0.85	-3.4893	0.0012*
HACCP record keeping systems	3.58	1.04	3.46	1.02	4.14	0.94	-2.9275	0.0060*

^a The stem "I feel knowledgeable about. . ." was used for all questions.

^b Likert scale: 1 = no knowledge, 2 = little knowledge, 3 = moderate knowledge, 4 = much knowledge, and 5 = full knowledge

* Indicated significance level of $\alpha < .05$.

Table 4. Abilities of College and University Managers' Related to Implementing Food Safety Practices (n=112)

Characteristic ^a	Overall (n=112)		Self Operated (n=87)		Contract-Managed (n=25)		t	Sig.
	Mean	±SD	Mean	±SD	Mean	±SD		
Take corrective action if a food safety violation occurs	4.34	0.74	4.25	0.78	4.64	0.49	-2.8323	0.0066*
Recognize potential food safety hazards and assess their severity	4.21	0.74	4.13	0.76	4.55	0.6	-2.7357	0.0092*
Identify critical control points	4.19	0.77	4.14	0.78	4.45	0.67	-1.8735	0.0689
Modify recipes so that critical control points are identified	3.95	0.85	3.89	0.86	4.18	0.8	-1.4897	0.1452
Implement a HACCP system	3.86	0.85	3.82	0.85	4.05	0.84	-1.1061	0.2767
Develop a basic record keeping system for HACCP	3.87	0.98	3.81	1.02	4.09	0.81	-1.3668	0.1792
Verify that the HACCP system is working	3.89	0.98	3.82	1.02	4.18	0.8	-1.7775	0.0829
Train employees to implement a HACCP system	3.84	0.96	3.78	0.97	4.14	0.77	-1.8162	0.0767
Develop flow charts for a HACCP system	3.72	1.01	3.67	1.03	4	0.87	-1.5319	0.1338

^a The stem "My ability to. . ." was used for all questions.

^b Likert scale: 1 = no ability, 2 = little ability, 3 = moderate ability, 4 = much ability, and 5 = complete ability

* Indicated significance level of $\alpha < .05$.

Applied Solutions

Local Foods: From Farm to College and University Foodservice

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Local Foods: From Farm to College and University Foodservice

ABSTRACT:

Reasons college and university foodservice directors are considering purchasing food from local sources include declining numbers of family farms and increasing concerns about food safety as well as providing education to students about food production while providing nutritious meals. Results from a survey of college and university foodservice directors in an agriculture-based Midwestern state show support for purchasing from local sources, primarily to support regional economies, provide fresher and higher quality food, good public relations, availability of safer food and the ability to purchase smaller quantities. Obstacles identified were adequacy, seasonality and reliability of supply, cost, dealing with more vendors, and getting approval for new suppliers. An overview of farm to college and university foodservice projects around the country and a profile of this state's college and university foodservice operations are presented.

INTRODUCTION

Agriculture, food and communities are three systems that interact in many ways. While these interactions are beneficial to human health, they can also compromise it, as four of the ten leading causes of death are related to dietary and lifestyle factors (Community Food Security Coalition, 2002). In addition, food transportation miles can have a detrimental direct impact on the environment and indirect impact on human health (Pirog, Van Pelt, Enshayan, & Cooke, 2001).

Declining numbers of small- to medium-size farms and vertical and horizontal integration along the food chain are concerns for rural communities and the family farms that support them. The latest USDA Census of Agriculture reports that just 3 percent of the nation's farms (those with sales of more than half million dollars a year) are producing more than 60 percent of America's agricultural goods. It was also reported that there were 18,000 fewer middle-sized farming operations than 5 years ago (Dreyfuss, 2004).

The U.S. farmer's share of retail food expenditures was 40% or higher in the 1940's and 1950's. However, by 1980 it had fallen to 37%, declined to 30% in 1987, and dropped further in 1997 to 21% (Elitzak, 1999). This decline can be partly explained by the increasing share of the food dollar spent on processing with increased convenience for the consumer, marketing, and corporate profits, and even by the concentration of power in food retailing. Direct marketing of food products to end users, be they consumers at home or foodservice operations, is one strategy to shorten the food chain between producers and consumers, thus increasing the farmer's share of the profit.

In recent years, direct marketing of farm products has increased as an important sales outlet for agricultural producers. The number of Farmer's Markets has increased 79% from 1994 to 2002 (USDA, 2002) and play an integral part of an urban-farm linkage while meeting the needs of farmers with small- to medium-size operations. Farm sales direct to consumers grew 36% between 1992 and 1997 and topped \$812 million in sales in 2002 (USDA, 2002). Direct farm sales to retailers, groceries, restaurants and other foodservices likely have seen similarly dramatic increases, although there are no data to support this.

The purpose of college and university dining services is to provide healthful and nutritious meals to students and others on campus. These campus foodservices have an important influence over students' eating habits as the dining center will typically provide the majority of a student's meals. Residence hall meal plans, special event caterings, convenience stores, mobile carts and a la carte are just a few of the dining options provided by foodservice departments on campus. Because campus foodservices are part of an educational institution, a mission to help student better understand food production practices and products can also exist.

Foodservice operations can be administered by the college and university or outsourced to a contract management company. Regardless of administrative origin, the college and university dining sector is a potential market for local farmers' products. Some higher education institutions are building partnerships with local food producers and, as a result, strengthening their communities and providing a learning experience to students (Valen, 1992; Nadeem Sidiqqi, former director of dining services at Cornell University, personal communication, April 2001; Santora, 2003).

Inclusion of locally produced foods in college and university dining services offers the opportunity to increase students' awareness of food growing and processing systems. As our family farm society has changed to an urban lifestyle, consumers in general have less knowledge about the origin of their food. Knowledge of where and how food is grown and processed can help allay concerns about the safety of the food consumed, particularly in light of concerns about food security and terrorism. This awareness of where and how food is grown has been an important theme in the Team Nutrition curricula targeted to school-age children with such lessons as "We Can Grow a Garden", "Food Grows", and "Where Do Foods Come From?" (USDA, 1995).

Concerns about food safety have increased dramatically, particularly after the terrorist attacks of September 11, 2001. One outcome of this concern has been passage of the Bio-Terrorist Act by Congress in 2002, which mandated trace-back capability along the food chain to within a four hour period of time. Final details of the legislation are currently in committee.

College and university foodservice operations are faced with many challenges in fulfilling their mission to provide safe and nutritious foods to students. Increasing budget constraints may influence administrators in educational organizations to contract with foodservice management companies, contract out meals to quick service chains that offer brand recognition to students, or increase use of processed or pre-prepared foods to decrease labor costs and in-house food handling of product as a means of ensuring safety. Yet, some institutions have successfully initiated changes in purchasing methods to include use of local suppliers.

Purchase of locally grown and processed foods provides a way for the educational institutions to better connect with their communities, serve fresh food to their patrons, and offer support for local food growers and processors (Gregoire & Strohbehn, 2002; Strohbehn & Gregoire, 2001, 2003; Sanders & Ancev, 2003; Starr, Card, Benepe, Auld, Lamm, Smith, & Wilken, 2002). Additionally, transportation miles and fuel use are reduced, thus providing an environmental benefit (Pirog et al, 2001). For smaller colleges, additional benefits include negotiation of purchase units smaller than wholesale packs or specific varieties of produce.

Characteristics of the college and university, such as whether the institution is public or private, large or small, urban or rural, and self operated or contracted managed, will influence purchase methods, quantities, quality, supplier and delivery availability, menus and selection of suppliers. For example, a contract managed college foodservice may have a set menu and set list of suppliers, who have reached a purchasing agreement with the contract company for all colleges that are serviced by the company. Public institutions typically are required to use a competitive bid process for purchasing of foods or items and require board approval for payments. These institutions may also have a minimum dollar value of purchases that can be made without the governing boards' approval. Policies may dictate the number of suppliers that must be informed about potential sales from the institution, or a specific geographic region for the supplier may be identified.

A recent survey of public institutions in Oklahoma (Sanders & Ancev, 2003), including colleges and universities, found that a majority of respondents would be willing to purchase local foods if institutional practices and policies supported such decisions.

Two-thirds agreed that local foods would be purchased if price and quality were competitive, and a local supply was available. In addition, respondents to this survey indicated there is some confusion as to health and safety information on local foods (19%) and regulatory information (19%). This finding is consistent with previous work by Strohbehn and Gregoire (2003) in which foodservice operators expressed uncertainty about whether local producers are considered “approved suppliers”. Food buyers must adhere to local, state and federal regulations when selecting food suppliers. Regulations are clearly defined with regards to inspection and supplier criteria for meat, poultry, dairy, and processed/packaged foods, but less clear for fresh produce (*Food Code*, 2001; Hamilton, 1999). Most of the institutions (75%) used a prime vendor from whom the majority of food items are purchased.

Previous research among other sectors of the foodservice industry (schools, healthcare and independently owned restaurants) indicates that obstacles to local food purchasing include reliability, adequacy and consistency of supply; year-round availability; safety of product; cost; knowledge of sources; and increased ordering, receiving, product processing and payment procedures (Strohbehn & Gregoire, 2003; Gregoire & Strohbehn, 2002; Starr et al, 2002; Johnson & Stevenson, 1998). In 1998, producers noted concerns about provision of liability insurance and quality control measures, both likely issues today as bio-security threats to safe food have increased (Johnson & Stevenson, 1998; Hamilton, 1999). College and university foodservices wishing to educate students about food sources and production practices will likely face these same challenges when purchasing from local suppliers.

Because characteristics of the institution and the campus culture will vary, each farm to college and university foodservice project will be unique. A review of farm to college and university foodservice projects around the country is helpful in understanding what factors contributed to the successes of these projects. A survey to assess what college and university foodservice directors in one state think and know about local food purchasing, and a composite of the campus characteristics can add to the body of knowledge, and provide useful information as action steps are taken on individual campuses.

DESCRIPTION OF THE SOLUTION

There has been increased interest in farm to college and university foodservice projects in all types of higher education institutions in different parts of the country. These projects have begun and have been successful due to a variety of factors. Information about farm to college programs at the national level is available from the Community Food Security Coalition (see www.foodsecurity.org/farm_to_college.html).

Cornell University in the state of New York has a self-operated foodservice department and for several years has successfully purchased from local producers. Cornell is part of a pilot project for a state-funded effort to develop and strengthen farm to college connections. (See www.cce.cornell.edu/farmtoschool/.) Nadeem Sidiqqi, former director of dining services at this university, was very committed to purchasing food products from local sources, and student groups have been active in ensuring this practice continued. Thus, external funding, a foodservice director advocate, and active stakeholder groups have demonstrated commitment to ensuring the success of this project.

At the University of Wisconsin (UW)-Madison, a project to encourage food purchases from local farms and farm cooperatives is now in place at six of the UW campuses. The project began with Sustainable Agriculture Research and Education (SARE) funding to investigate the potential for colleges and universities across the country to purchase local, sustainable food products. The report, “Something to Cheer About: National Trends and Prospects for Sustainable Agriculture Products in Food Service Operations at College and Universities” (Johnson & Stevenson, 1998) highlighted that local food purchasing initiatives begin and are sustained for a number of reasons. Two colleges in the UW study are religious institutions with strong principles of agricultural stewardship. At other schools in the project, students were responsible for initiating inclusion of local foods, typically organically grown, on menus. Again, an external funding source and support from multiple stakeholder groups contributed to the success of the colleges and universities in the UW project.

A similar project at Middlebury College in Vermont was initiated solely as a result of a senior seminar in Environmental Studies. Students learned about a specific topic (the college’s food purchasing policy) and then applied it to a real world situation (purchasing locally grown foods and educating the college community about sustainable agriculture). Students identified prospective food growers and suppliers and developed profiles of these for display in campus dining centers. (See www.cr.middlebury.edu/es/localfoods/LocalFoods.htm)

External advocates have helped change the college and university foodservice at Yale University. Famed chef Alice Waters is working with one of Yale Universities’ dining halls to transform it into a showcase for use of locally grown products and a

platform to educate students about the importance of what they eat (Santora, 2003).

Aramark, a contract management company, is the foodservice provider for the university.

To address increased food and labor costs, fewer menu items were offered at each meal.

Successful local food projects had been conducted in Iowa in several sectors of the foodservice industry, including schools, hospitals and long term care facilities, and independently owned restaurants. These projects used case studies and mail surveys to gather empirical data among the foodservice decision makers in each group to determine perceived benefits and obstacles to local food purchasing (Strohbehn & Gregoire, 2003; Gregoire and Strohbehn, 2002). Grant support was available to help fund a broker for sourcing of local food products.

Because Iowa's economy is based heavily on agriculture and food processing industries and has a well-earned reputation for the quality of education, we reasoned foodservice directors in this state would be interested in local foods initiatives. While there are fewer numbers of farms in the state, and consequently fewer students being raised on farms or with an awareness of food production, there is still a strong agricultural heritage.

A mail survey was sent in September of 2003 to all college and university foodservice directors at all higher education institutions in Iowa that offered dining services (N=28). After two follow-up efforts, responses were received from 12 of the 28 institutions, for a response rate of 43 %. In two returned surveys, only partial sections of the survey were completed, thus a more realistic response rate of 36% was achieved. The survey consisted of 7 sections: perceived benefits (12 items) and obstacles (16 items) to purchasing of Iowa foods; information about the college or university foodservice;

purchasing policies and procedures; important supplier selection factors (14 items); level of importance students place on various issues (18 items); and attitude statements about food purchasing and local support (22 items). A 5-point Likert type rating scale (5 = Strong benefit or Most Important) or multiple choice options were presented.

Findings indicated high interest and many benefits to purchasing food from local growers and processors. Responses were analyzed using SPSS for Windows (Version 11.0, Chicago, Ill). Means, medians and frequencies were calculated.

Data from this survey, although limited to operations in one state, can provide a picture of “the current thinking” among college and university foodservice administrators about food purchasing practices and policies, their perceptions of student interests on their campuses; and establish a profile of institutional characteristics in an agricultural state. Characteristics of responding institutions are shown in Table 1.

Table 1. Characteristics of responding colleges and universities in Iowa (N = 12).

Characteristic	Value		
Community population	Median = 10,000 (range 1,800 – 120,000)		
Student enrollment	Median – 1,200 (range 525 – 13, 926)		
Private Institution	n = 10		
Contracted managed foodservice	n = 8		
Number of contracts with vendors	yes = 10		
Established policies regarding:			
Payment procedures	yes = 7	no = 3	missing = 2
Food quality	yes = 7	no = 3	missing = 2
Solicitations	yes = 7	no = 3	missing = 2
Selection of supplier	yes = 6	no = 4	missing = 2
Food production practices	yes = 6	no = 4	missing = 2
Supplier approval	yes = 6	no = 4	missing = 2
Campus access	yes = 6	no = 4	missing = 2
Awarding of contracts	yes = 5	no = 5	missing = 2
Procurement methods	yes = 5	no = 5	missing = 2
Delivery procedures	yes = 5	no = 5	missing = 2
Location of food sources	yes = 4	no = 6	missing = 2

The majority of responding colleges were private institutions (n = 10), contract managed (n = 7) and all offered room and board plans to the median enrollment of 1200

students. A median of approximately 2000 meals was served each day during the academic year. A la carte meals and catering services were offered by the majority of the foodservice departments with 4 of the 12 foodservices operating convenience stores. Vending services were operated by 6 of the 12 foodservice operations. Approximately 90% of respondents (n = 9) estimated “from scratch” cooking was used for 75% or more of menu items and that production kitchens were located in each dining hall. Seasonal foods were featured in all of the institutions.

Procurement systems were described in one of three ways. Each kitchen/service center contacted suppliers with orders (n = 5); a prime vendor was contracted with deliveries to each service center (n = 5) or a central purchasing center contracted with vendors and then delivered to service centers (n = 1). Two of the 12 schools participated in a purchasing cooperative while the total number of vendors used to supply food ranged from 4 to 20. Contracts were in place with some of these vendors for a typical period of one year. The maximum number of vendors reported that a foodservice director could reasonably purchase from was either 10 or 15. For most of the reporting institutions, established policies were in place for many purchasing functions, such as selection of supplier, food quality, payment procedures, and solicitation. The extent these policies were reported is somewhat surprising considering that almost all schools were private and thus not bound by state and federal accountability regulations. The existence of such policies is considered best practice and provides guidance to foodservice directors and information to producers or other potential suppliers. Even more surprising was that 6 of the 10 institutions indicated a policy existed with regards to food production practices, and 4 had policies regarding location of food sources. Perhaps because of these policies,

typically it was the director and/or foodservice managers who established contracts with vendors. It was these same individuals who were involved in selection of suppliers as well. However, 7 institutions reported that the contract management company was also involved in selection.

With regards to purchase of local foods, food safety was either the “most important consideration” (n = 7) or “a somewhat major consideration” (n = 4) for all schools responding. Respondents rated the importance of specific factors in selection of a food supplier for college or university foodservices using a 5-point Likert type scale (5 = Very Important). Food safety assurances and certification of food production practices were considered the two most important of the factors listed, with mean ratings of 4.8, respectively. Reputation among other foodservice directors and length of time in business were considered the least important with mean ratings of 3.7. Mean ratings of importance for factors in selection of supplier are shown in Table 2.

Table 2. Mean ratings of importance of factors in selection of supplier.^a

Selection Factors	Number of respondents	Mean rating
Food safety assurance	10	4.8
Certification of food production practices	9	4.8
Quality of products	10	4.7
Resolving conflicts	10	4.6
Reliability of vendor	10	4.6
Prices	10	4.5

Ease of ordering	10	4.4
Ability to help out in a jam	10	4.4
Delivery schedule	10	4.3
Ability to locate specific items	10	4.1
Relationship with vendor	10	4.1
Package forms and size	10	4.0
Reputation among other directors	10	3.7
Length of time in business	10	3.7

^a 5 = Very important; 3 = Somewhat Important; 1 = Not Important

While the Middlebury farm to college project in Vermont was initiated by students, it is the opinion of college and university foodservice directors in Iowa that the students would place greater importance on increased menu options, flexible meal plans, food costs and nutritional issues than on production practices of foods, such as organically grown or non-genetically modified. Table 3 shows the assessment made by directors of students' level of importance of 18 food related issues. Directors used a 5-point Likert type scale with 5 = Very Important. A soon to be published survey of college and university foodservice directors in New York with similar food issues will allow for determination of geographical differences.

Table 3. Perceptions of college and university foodservice directors (N = 10) in Iowa of the level of importance issues are to students on their campuses.^a

Issue	Mean rating
Flexible meal plans	4.6
Increased menu options	4.5
Lower prices	4.1
Low fat options	4.0
Vegetarian options	4.0
Organic food	3.7
Nutritious food choices	3.7
Nutrition information	3.7
Environmental considerations	3.6
Production practices	3.4
Vegan options	3.4
Use of additives/preservatives	3.4
Recycling of waste products	3.3
Fair trade coffee	

^a 5 = Very important; 3 = Somewhat Important; 1 = Not Important

In the final section, college and university foodservice directors rated their level of agreement with attitude statements that were positively and negatively phrased using a scale from 1 to 5 with 5 = Strongly Agree. It was clear from responses that there is a strong sense of responsibility to help support Iowa farmers (mean rating of 4.1) and help

the economy (mean rating of 4.4). Respondents indicated a willingness to ask suppliers to source locally (mean rating of 3.9) with the caveat that dealing with more vendors is a concern (mean rating of 4.0) as was a willingness to pay more for local foods (mean rating of 2.3). Payment procedures were also cited as a concern for directors (mean rating of 3.6). However, respondents did note that if students requested locally grown foods, these would likely be served (mean rating of 3.2). Respondents also noted that payment procedures of the institution may be a concern for local purchases (mean rating of 3.6). In addition, the lack of year round availability (mean rating of 3.7) and readily available, dependable sources of locally grown foods (mean rating of 2.9) were also concerns. Respondents disagreed that imported produce is safer (mean rating of 1.8) and that is not the responsibility of colleges and universities to help keep local farmers in business (mean rating of 1.9). There seemed to be some confusion with regards to institutional and state regulations allowing purchase of locally grown foods (mean ratings of 3.6 and 3.5, respectively). Package materials were less of a concern (mean rating of 2.7). These findings mirror those found in previous assessments of foodservice directors in other sectors of the industry in Iowa (Strohbehn & Gregoire, 2003; Gregoire & Strohbehn, 2002) and of the study in Oklahoma (Sanders & Ancev, 2003).

CONCLUSIONS AND APPLICATIONS

Qualitative projects and quantitative research has concluded certain factors are critical for successful food supply chains to operate. These are based on trust, mutual understanding and satisfaction. In order for foodservice buyers in all sectors of the industry to work successfully with local food producers, certain factors such as consistent high quality; assurances of a safe food product; adequate and consistent supply;

competitive pricing (more for institutional markets); ease of ordering, delivery and payment procedures; standard size packages; and supply dependability are all important. Consistent messages from buyers in all sectors about benefits and willingness to work with local producers indicate that foodservices are a very feasible new market for producers to consider, yet time issues for the director or buyer have to be addressed. College and university foodservice directors across the country, and in Iowa, appear willing to support their local economies and respond to student requests for specific foods, if safe and nutritious foods can be served.

Strategies to overcome identified obstacles and ensure an efficient and effective food supply chain include formation of cooperatives by producers and foodservice buyers to streamline ordering, receiving and payment processes. Promoting when local foods are used (on printed menus, web sites or table tents) can result in good public relations for the institution and increased student awareness about food sources and production practices. Institutions can adopt policies that encourage purchases from local sources.

Buyers need to know what and when products are available and want assurances about food safety. Multiple responsibilities for the foodservice buyer are common so producers need to understand the many demands they face and regulations of compliance. Producers need to avoid time and temperature abuse of items and instruct employees handling products to use good hygiene. Packaging materials need to protect the integrity of the food. In addition, producers need to ensure food safety practices before, during and after harvest are adhered to (See <http://postharvest.ucdavis.edu>; <http://www.gaps.cornell.edu> ; <http://www.extension.iastate.edu/hrim/localfoods>

While successful projects often have received support from grants or other in-kind aid, there are low and no-cost action steps that can be implemented for non-funded projects. Recognition of the buyer-seller needs and strengths by both parties is critical to establishment of successful long-term relationships based on mutual satisfaction of objectives.

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