7-7-2009

Does Educational Intervention Reduce the Number of Food Violations.

Karen Koechlin M. Koechlin

Does Educational Intervention Reduce the Number of Food Violations?

An evaluation of the Food Employee Educatioon and Safety Training (FEEST) in Orange County, California.

by

Karen Koechlin

Georgia State University

Institute of Public Health

Atlanta, Georgia

June 30, 2009

Does Educational Intervention Reduce the Number of Food Violations in Orange County, California?

Abstract

The objective of this study was to examine the educational intervention that restaurant employees received to see if it reduced the number of food violations in Orange County, California, U.S.. The class, which began in 2007, is known as the Food Employee Education and Sanitation Training (FEEST). This study revealed that the post-test results from FEEST demonstrated a significant improvement in food safety knowledge, and almost all participants showed significant improvement in food safety knowledge. A comparison of inspection reports immediately before and after participation in FEEST showed that food establishments greatly reduced the number of major violations, but the reduction in minor violations was minimal. Further results showed that overall, post-class inspections were not helpful in reducing the number of violations. Moreover, results also showed that out of the participating restaurants, those who received a fee and formal letter requiring correction of violations, known as a Notice of Violation (NOV) or Notice of Decision (NOD), do well on inspection reports in reducing major violations than those who did not receive one, but both types of restaurant were not able to significantly reduce minor violations. These results might be associated with the knowledge and commitment of the restaurant employees. Restaurant employees are not using the food safety knowledge they gained during the educational intervention. Therefore, further training is required to educate restaurant employees, and more should be done to encourage the practice of safe food handling and sanitation.

Definitions:

NOV: Notice of Violation – A formal report that specifies violations observed in a food facility during an inspection and requests correction of these violations based on the law. The NOV letter is accompanied with a fee.

NOD: Notice of Decision - A formal report accompanied with a hearing that is presented in a contract format. This 'contract', when signed, legally binds the food facility representative to correct the violations listed in order to bring the food facility under compliance. The NOD contract is accompanied with a fee and in most cases recommends particpationin the FEEST Program..

Major Violation – An observation made by a food inspector that poses a significant risk to public health

Minor Violation - An observation made by a food inspector that does not pose a significant risk to public health

Table of Contents

ABSTRACT ..... **II**

CHAPTER I: INTRODUCTION **1**

EDUCATIONAL INTERVENTION REDUCES THE NUMBER OF FOOD VIOLATIONS 4
STATEMENT OF THE RESEARCH PROBLEM 6

CHAPTER II: LITERATURE REVIEW **7**

CHAPTER III: METHODOLOGY **19**

METHODS 21
RATIONALE OF THE METHODS 21
RESEARCH QUESTIONS 23

CHAPTER IV: RESULTS **24**

CHAPTER V: DISCUSSION AND CONCLUSION **34**

WORKS CITED **40**

APPENDIX A **53**

APPENDIX B **55**

Chapter I: Introduction

Foodborne illness is defined as a disease, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food. Foodborne illness is a preventable disease that affects people all over the world and is considered a growing public health issue (World Health Organization, 2007). Although the proportion of food illness outbreaks that result from food eatean at restaurants is unclear, restaurants have been considered as a chief source of food illness outbreaks. (Jones & Angulo, 2006). Unlike food prepared at home, a contaminated food served at a restaurant has the potential to affect many people. Consumers and media have become more interested in and concerned about the food safety and sanitation of food establishments (Lee et al., 2009), particulary with the increase of reported illnesses linked to foodborne pathogens and viruses (Golan et al., 2004). For instance, one of the most memorable in the United States (U.S.) was the Jack in the Box E. coli outbreak in 1993. Consumption of contaminated meat from 73 Jack in the Box restaurants resulted in 700 reported illnesses and the death of four children (Golan et al., 2004). The number of reported cases of foodborne outbreaks in Washington State, U.S. increased dramatically for two years following the Jack in the Box incident. According to the Washington State Department of Health (2007), the increase was probably due to an increased public awareness in reporting possible food poisoning cases to public health agencies. The number of foodborne outbreaks in Washington began and continued to decline from 1995 to 2005 and are currenlty consistent to reporting levels prior to 1993. The Washington State Department of Health attributes the steady decline to lower levels of reporting, and not necessarily to fewer outbreaks

Food hygiene education and the active promotion of food safety for businesses and the public are vital to reduce the incidence of food poisoning. The U.S. Food and Drug

Administration (FDA) establishes food safety guidelines and regulations that are required for food labeling and the safe preparation, manufacture, and distribution of food products. The FDA recommends that restaurants and other retail food stores and food service establishment operators must consider:

- Incorporating food security awareness, including information on how to prevent, detect, and respond to tampering or other malicious, criminal, or terrorist actions or threats, into training programs for staff, including seasonal, temporary, contract, and volunteer staff.
- Providing periodic reminders of the importance of security procedures (e.g., scheduling meetings, providing brochures, payroll stuffers).
- Encouraging staff support (e.g., involving staff in food security planning and the food security awareness program, and demonstrating the importance of security procedures to the staff) (National Restaurant Association, 2005).

These recommendations can be applied to any food establishment and summarized in the following statement; Food facility managers can help prevent foodborne illness by providing regular training, justifying safe food practices, and encouraging their staff to handle food safely. In 1997, U.S. President Clinton declared the National Food Safety Initiative, a collaboration to strengthen and improve food safety in the U.S.. The intiative included inspection and preventive systems, new tests to detect pathogens, increased funding for FDA inspections and food safety research, as well as public campaigns to encourage safer food handling (Crutchfield & Roberts, 2000). There was not, however, a system put into place focused on educational interventions for local food establishment personnel. It is essential to first acknowledge the factors that lead to successful outcomes based on educational interventions in order to be implement a program that will work. Since training programs for managers may be costly, it is also important that a

training program include an evaluation to test for its effectiveness, in this case for improvement in food safety and hygiene (Cotterchio, 1998).

Although no training program is complete without an evaluation of its effectiveness, relatively few reported evaluations of the effectiveness of food hygiene education have been reported. The studies that have been identified provide mixed reviews and do not convincingly make the case for food hygiene education in their current form.

Worsfold (1993) evaluated a six-hour training course in the U.K. by using pre- and post-course knowledge and attitudes surveys. The study concluded that particpants only "seem to be" more able to identify food safety hazards and risks. Yet a more recent study found positive behavioral changes in facilities where the managers had been trained, of which most had attended the six-hour training course (Seaman & Eves, 2006). In another study, one food safety course at two different locations was observed to have two different outcomes. For one location, the study concluded that other factors, such as prior education and work experience, had greater positive outcomes than particpation in food hygiene courses. The assessment at the second location showed that the course had little influence on knowledge levels or improvements in intended behavior, but did result in positive effects in attitude among the students (Seaman & Eves, 2006). Another similar study using pre- and post-course knowledge and attitudes surveys to evaluate food safety training found that the training had an insignificant effect on hygiene standards (Mathias et al., 1994).

Maintaining a high quality of training is essential since it is possible that inadequate training might do more damage than good.Without a qualified instructor, food handlers may be given wrong information or retain previous misconcepitons about safe food practices (Rennie, 1994). In a study comparing food safety knowledge of food establishment managers, Lynch

(2003) found that the sources of training, certification, and experience significantly affected the level of basic food safety knowledge. However, the increased hours of training or the time lapsed since training did not significantly affect the level of knowledge. This may support the case that a higher quality, versus the quantity, of training sources is ideal for a better and long-term understanding of food safety principles.

Constant on-site training can be a valuable tool in maintaining high food hygiene standards. However, a survey of hygiene standards by environmental health officers during routine inspections of food premises in England and Wales identified poor training standards in most premises where inspectors considered the hygiene so bad that the foods handled might present a risk to consumers (Seaman & Eves, 2006). The poor level of hygiene and failed attempts of training may be attributed, in part, to the food-safety attitudes and beliefs of management. Allwood et al. (2004) identified significant correlations between the management's attitude to training, level of training, knowledge about food hygiene, and standard of food handling procedures in food establishments. Buchholz et al. (2002) reported high risk practices in food premises with untrained staff and good practices where hygiene training had been conducted.

Educational Intervention Reduces the Number of Food Violations

In November 2003, a large Hepatitis A outbreak was linked to a single restaurant in Pennsylvania, U.S.. The outbreak resulted in 601 patients of which 124 were hospitalized and three died, The outbreak was traced back to contaminated green onions used in the salsa (Wheeler, 2005). In 2006, 52 of the 71 persons that reported becomng ill after eating at Taco Bell restaurants were confirmed to have E.Coli poisoning. Of the people reporting illnesses, 53 were hospitalized and 8 developed kidney failure (CDC, 2006). Over 600 patrons reported

becoming ill after eating at two Lansing, Michigan, U.S., restaurants in the spring of 2006. These were two separate incidences in which Norovirus was confirmed as the source of the illnesses (CDC, 2007).

Outbreaks in the early 1990s resulted in an increased awareness of food safety issues among consumers, and an increase in regulatory initiatives to reduce the incidence of food borne diseases (Golan et al., 2004). For example, after the Jack in the Box incident, the company began to implement a hazard analysis and critical control point (HACCP) program, which in the past was mainly used in food-manufacturing plants. Food safety management based on the HACCP system provided detailed descriptions of how food should be handled in order to avoid another outbreak (Bertagnoli, 1996). Jack in the Box also turned the food-safety operating procedure into a stand alone training module. Shortly after, other large restaurants chains began to build interest in safety methods such as the HACCP system (Golan et al., 2004).

The responsibility of food establishments to maintain their patrons safe should be of utmost importance in the food business. Consumers should be able to feel that the meal provided by the food establishment is safe. Unfortunately, although restaurants in the U.S. are subject to inspections by local health departments, studies consistently show that a relatively high percentage of restaurants routinely have inadequate food hygiene practices (Roberts and Sneed, 2003). Although local health agencies perform routine inspections, foodborne disease outbreaks continue to exsist. The history of foodborne outbreaks, and persistent new cases with determital affects, is a cause for attention. This study proposes that an educational intervention, such as the FEEST program, may be a part of the solution in trying to reduce foodborne illnesses related to food establishments.

Statement of the Research Problem

This retrospective study will focus on the effects of the class-room based Food Employee Education and Sanitation Traning (FEEST) intervention on food facilities in Orange County that have taken the course. This study will use data from facilities that have participated in the County training program as part of a Notice of Violatioon or Decision (NOV or NOD) requirement, or voluntarily upon request of the food facility representative. This paper will show that the class has been successful and has room for growth and development. The following are possible comparisons that this study will investigate:

- scores from a general food safety knowledge evaluation given before and after particpation in FEEST
- routine inspection reports immediately before and after participation in FEEST
- routine inspection reports from food establishments that were required to participated in FEEST versus those that volunteered
- routine inspection reports from several consecutive audits after participation in FEEST.

Chapter II: Literature Review

Consumers are responsible for food handling and preparation at home, but must place their trust in foodservice workers to handle and prepare food properly when eating out. According to Jones and Grimm (2008) from the Tennessee Department of Health, the public has misconceptions and extremely high expectations of what health inspections can guarantee. Food saftey in the foodservice industry is important considering the number of people that regularly dine out and the continual increase in this number. In 1998, an estimated 46% of Americans patronized a restaurant on a typical day. While this percentage dropped to about 44% in 2006, the restaurant industry still accounts for a 47.5% share of the food dollar (National Restaurant Association, 2005). In addition, Carlson et al. (2002) calculated that restaurants accounted for 14% of all U.S. food consumption in grams in 1994. U.S. food away from home expenditures have been continuealy incrasing, from 26% in 1960, 34% in the mid-1970s, to about half of total food expeditures in 2004, begninning in the mid-1990s (Carlson, Kinsley & Nadav, 2002; Stewart, Blisard & Jolliffe, 2006). During this time, consumers and the media have become more interested and concerned with food safety and sanitiation of restaurants (Lee et al., 2009) particularyl following the 1993 Jack in the Box outbreak (Cotterchio et al., 1998). The 1990s was a period of increased food safety measures by suppliers and large restaurant chains in the U.S.. Still, a substantial number of foodborne outbreaks have been associated with food prepared or served at restaurants since then (Cotterchio et al., 1998). From 1998 to 2004, 9040 cases of foodborne disease outbreaks were reported to the CDC, of which 4675 (52%) were associated with restaurants (Jones & Angulo, 2006).

Foodborne illness inflicts a substatial economic burden on society. Annual medical costs, productivity losses, and cost of premature deaths due to five of the major foodborne pathogens

are estimated to be at $6.9 billion amd is only a fraction of the cost (Buzby, 2001; Crutchfield and Roberts, 2000). Outbreaks and individual cases of food borne illness can lead to costly lawsuits, high insurance premiums or even the loss of a business for the implicated restaurant or chain (Buzby, 2001). Buzby et al. reviewed 178 U.S. jury trials involving foodborne pathogens that occurred between 1988 to 1997. Although a majority of the plaintiffs, approximately 76%, named one defendant, 14% named more than one defendant for a total of 234 separate defendants. Of the 234 defendants 72 (32%) of the law suit defendants were restaurants. Out of the 175 cases with award information, it was estimated that only 31% of the lawsuits resulted in compensaton paid by the implicated firms. Awards varied by the severity of the illness. For instance, the average awards were $274,580 for illnessess resulting in premature death; $141,199 if the plaintiff was hospitalized, and $110,916 for less severl or milder cases.

The Jack in the Box company lost approximately $160 million dollars in sales and other costs 18 months following the E.coli outbreak. The other costs included the recall of all the hamburger meat from their restaurants and legal costs. All of the law suits from customers that had become ill were settled out of court. One family received a reported 15 million dollars after their child suffered brain damage (Golan et al., 2004). A series of lawsuits against Odwalla, a California, U.S., juice company first began in 1996. The company was fined $1.5 million after pleading guilty for a product contaminated with E. coli. In this case, 14 children became ill and one child died after consuming Odwalla's apple juice (Henkel, 1999). Several of these children suffered HUS, hemolytic-uremic syndrome, and permanent kidney damage, which resulted in a settlement of $12 million in early 2000 (Marler, 2009). Finley School District in Washington State, U.S., paid a $4.6 million as a result of a case in which 11 children became ill with E. coli food poisoning after eating undercooked ground beef during school lunch at Finley Elementary

School in 1998. Most of the money went to a child who was seriously injured and has a prognosis of several kidney transplants needed during her lifetime (Marler, 2009). Chi Chi's Restaurant settled with $6.25 million on behalf of a man who was forced to receive a liver transplant after contracting hepatitis A food poisoning. This outbreak was traced back to green onions that were served at a ChiChi's restaurant near Pittsburgh, Pennsylvania in 2003 (Veil et al., 2005; Marler, 2009). Another case occurred in 1992 when an outbreak of Hepatitis A caused Le Petit Gourmet, the largest catering company in Denver, Colorado, U.S., to close for two weeks. The outbreak caused the company a loss of $60,000 in food and public relations advise. The negative publicity impinged on the company's net income the following year, when it dropped to half of the 1992 pre-crisis figure (Morrison et al., 1998; Knight et al., 2007).

Although food safety is essential for any food business success there is a number of studies that show restaurants continue to have inadequate food safety practices, which in many cases are indicative of possible foodborne illness. In Los Angeles County, Califonria, U.S., Buchholz et al. (2001), found that low overall inspection scores, restaurant size and improper food handling factors were positively associated with investigated foodborne illness cases. These factors included incorrect storage of food, reuse of food, lack of employee handwashing, lack of thermometers, and food protection violations. In an observational study, Green et al. (2006) found that food workers performed approximately 8.6 activities that require handwashing per hour. According to Green et al. (2004) food workers made attempts to correctly wash their hands after 32% of those activies and correctly washed their hands after only 27% of those activities.

Another cause for concern is that food establishments do not exhibit random one-time event violations. Instead, inspectors continuously observe recurrent violations during subsequent

inspections. Simply, the knowledge that inspectors will, without notice, arrive at a food establishment to conduct an assessment does not contribute to any improvement or alter the type of violations seen. Philips et al. (2006) did a study of random 4,044 inspections conducted in 31 Oklahoma counties during 1996 to 2000. The study aimed at analyzing the inspection reports in order to determine rates of critical violations and recurrent violations in medium and high risk establishments. This study found that restaurants in Oklahoma have a repeat violation rate of more than half of all violations. Regional restaurants are inspected more, have a higher number of violations and were more likely to have recurrent critical violations than independent restaurants. Philips et al. (2006) determined that inconsistencies in inspectors did not attribute to differences in violation rates among the food facilities. This study called for investigating the 10% of restaurants that did not have critical violations to determine what causes their best practices in order to create successful intervention strategies for the restaurants with repeated violations.

Orange County, California, U.S., has 12,098 food facilites that 53 health inspectors, known as Environmental Health Specialists (EHS), must assess three times a year (County of Orange, 2009). According to the Environmental Health Department, the objective of the EHS is to "educate the operators and provide the best public service"(Orange County Health Care Agency [Brochure]). In the year 2004, the Journal of Environmental Health mentioned in one of their articles that California, being the most populous state, had not yet joined such states as New York and Pennsylvania in adopting a retail food code modeled after the FDA's Model Food Code, which is a scientific resource that aims to prevent foodborne illness (Environmental Health-Net, 2004). On May 15, 2006, Governor Arnold Schwarzenegger signed into law SB144, which replaced the California Uniform Retail Food Facilities Law (CURFFL) with the California

Retail Food Code, also known as Cal Code. This new code was brought to existence by the California Retail Food Safety Coalition (CRFSC), and was a collaborative effort between food facility regulators from all levels of government. The FDA's Model Food Code was used as a model in creating Cal Code (California Retail Food Safety Coalition, 2007).

The new system, Cal Code, focuses on preventing practices that have been shown to contribute to foodborne illness. Cal Code focuses on the following set of practices or risk factors, identified by the FDA and CDC, that are most often associated with foodborne illness:

RISK FACTORS

- Improper Holding Temperatures
- Inadequate Cooking
- Poor Personal Hygiene
- Contaminated Equipment
- Food from Unsafe Sources

In addition, the FDA and CDC identified the following public health interventions to aid in reducing the number of foodborne illnesses:

INTERVENTIONS

- Demonstration of Knowledge
- Employee Health
- Time/Temperature Control
- Consumer Advisory.

If present at a food facility, these risk factors constitute a major violation if and are considered an imminent health hazard. Major violations, if not immediately corrected, are cause for the suspension of the food facility's health permit or closure (CRFSC, 2007).

There are several voluntary and mandatory opportunities for food facilities in Orange County to obtain information and learn the skills necessary to comply with the food law and provide safe products to their customers. Food facilities can maintain their product safe for the consumer by; 1) Providing daily guidance and instruction from supervisors, managers, or the employee(s) with a Food Handler Certification. 2) Responding to Health Department audits, where the EHS provides a list of minor and major violations and the corrections needed in order to maintain in compliance. 3) Attending the Orange County's Food Employee Education and Sanitation Training (FEEST). These are discussed below in detail.

Food Handler Certification

The State of California, Department of Health Services, adopted Assembly Bill (AB) 1978, which became effective January 1, 2000 as a means of ensuring that food workers have the necessary knowledge to keep the public safe from food-borne illnesses. This AB requires that all existing food facilities (i.e., food establishments, mobile food preparation units, stationary mobile food preparation units, and commissaries) that handle unpackaged food must have at least one owner or employee who has successfully passed one of the approved and accredited food safety certification examinations (Davis, 2001).

The Conference of Food Protection and Food and Drug Administration's published Model Food Code has set a standard knowledge base that a certified food handler (CFH) must have. ServSafe, Thomson Prometric and Professional Testing are the three most popular companies currently approved to administer their food safety exam. It is highly recommend that preparation in the form of a training course, textbooks, computerized materials, and online resources takes place before taking any of the comprehensive exams. New technology, scientific

advances and emerging pathogens make it necessary retake the exam and re-certify every 5 years (Davis, 2001; Cal Code 2007).

Newly constructed unpackaged food facilities, food facilities that no longer have a certified person, or have undergone a change of ownership have a period of 60 to comply with the CFH requirement. The CFH plays a vital role in the food establishment and is responsible for the instruction of all employees at the facility who handle, or have responsibility for handling unpackaged food to ensure that they have sufficient knowledge regarding the safe preparation and service of food. Cal Code (2007) Article 2., Section 113947, states that all food employees shall have adequate knowledge of, and shall be properly trained in, food safety as it relates to their assigned duties. The CFH may tailor the food safety instruction so as to be relevant to the employee's specific duties (Davis, 2001). For example, an employee that works at the grill needs to know the proper cooking temperatures of different meats versus an employee who works at the buffet may only be required to know the proper hot and cold-holding temperatures for the different foods.

A person may not serve as the CFH at more than one food facility since the certified person plays such a vital role in the daily ativity of the food establishment. However, multiple connecting food facilities within the same site and under the same management, ownership, or control, are considered to be one food facility. Examples of these types of food facilites may include hotels with bars or coffee shops or snack bars within a larger site. Additionally, the certified person does not need to be present at the food facility during all hours of operation. (Davis, 2001). The certification, however, must be available at the facility at all times (OCHCA, 2007). Each Health Department or enforcement agency has the authority to deny or revoke a food establishment's permit if proof of having passed a food safety examination cannot be

provided (Davis, 2001). In addition, a violation of this requirement can be punishable by a fine of not more than 100 dollars for each day that the facility remains in violation (Cal Code, 2007).

Orange County Department of Environmental Health – Food Protection Program

The Food Protection Program (FPP) under the Department of Environmental Health conducts inspections and issues permits to local businesses. Regular inspections not only provide a means to assess restaurants for food handling practices and sanitary issues, but also facilitates a relationship between the inspectors and food operators. Through regular visits to food facilities inspectors, formally called Environmental Health Specialists (EHS), can play a role in the educating the public on the five CDC risk factors (adopted from the FDA), safe food handling practices, and other food issues. Food facility operators are free at any time to ask questions, discuss concerns, and make comments to their inspector during an inspection, via email, or over the phone. The foodborne illness hotline is available 24-hours a day (OCHCA: Brochure; OCHCA, 2006).

The EHS conducts inspections based on the California Retail Food Code, also known as Cal Code, which is centered around the five CDC risk factors. The FPP in Orange County has several methods of communicating important outcomes, findings or results of inspections and investigations to the general public. The food facility reports, inspection notification seals, award of excellence program, and website are the components that make it possible to provide the public with any information needed about the food establishments in Orange County (OCHCA, Brochure; OCHCA, 2006).

1. Food Facility Reports: The report lists violations, corrective actions taken, and directives organized into two sections; one for major violations and one for minor violations. The

most recent inspection report must be present at each facility and readily available for any customer who requests to review it.

2. Inspection Notification Seals: Two seals are used to demonstrate the overall sanitation condition of the facility. These seals are the compliance and re-inspection seals. The Compliance seal is given to a restaurant that, for the most part, meets most of the food safety and sanitation standards. The non-compliance or re-inspection seal is given when a follow-up is required.
3. Award of Excellence Certificate: This incentive program recognizes restaurants that have achieved excellence in food safety and sanitation practices for one entire calendar year. The requirements that determine eligibility for this award are:
    a. No major violations
    b. No more than an average of six minor violations for each inspection
    c. A person with Food Handler Certification
    d. A minimum of two inspections within a calendar year
4. Food Protection Program Website (www.ocfoodinfo.com): The website provides the public access to closure lists, award list, inspection reports and much more. Most of the information the public may want about a facility can be found here. The Awards List link contains the names of all facilities that have received an Award of Excellence for the previous year. It also contains the requirements that must be met in order to receive the award. A drop down menu with each city is available in order to search for all restaurants that have received an award in a particular city. An advanced search option is also available. Through the website the public can also view inspection reports, which are the same reports that the inspector leaves at the facility on the day of their inspection

(OCHCA, 2006). Once a food facility's information is found through a search by name, address and/or cross streets, a hisotry of events with their dates for that facility becomes available. Each event listed has the purpose of the inspector's visit (i.e. inspection, follow-up, complaint investigation, etc…) and the title of any major violations (in red) or minor violations (in blue) that were observed on that date. The definitions of major and minor violation, which always appear on the top of the inspection report page for the public to use as reference, are stated in the box below. The formal full report can be downloaded as a PDF file which, exept for the mailing address that appears as 'ON FILE' is exactly what the facility's PIC receives at the end of an inspection.

Major Violations pose the highest risk of causing food poisoning (or foodborne illness. Major violations are sometimes resolved during the inspection or a re-inspection may be scheduled to verify compliance.

Minor Violations pose less risk of causing food poisoning (or foodborne illness), and do not warrant immediate verification of compliance.

The website also provides a link to an alphabetical list of the closures that occurred in the past sixty days. The closures are posted online monthly so that the public can browse through the list of restaurants that had major violations not resolved during the inspection, and therefore, warrented a closure. A facility closure report includes the reason(s) for closure and can be viewed by simply clicking on a name from the list. Additinally, the FPP website provides the public with advisories, forms, bulletins and county contact information (www.ocfoodinfo.com).

Notice of Violation

Some facilites fail, some pass, and others pass with a pending re-inspection. A re-inspection involves yet another visit by the health inspector and, although it is free of charge for the food facility, re-inspections take FPP time and, therefore cost, money (County of Orange, 2007). More importantly, facilities that are due for a re-inspection have issues that may result in an increased threat to public health. These facilities may have numerous minor violations, several major violations, or both. If issues persist, especially after the EHS has attempted to bring the facility to compliance through providing education and resources, the county then applies the power of enforcement (California Health and Safety Code, 2007). Cal Code Article 2, Section 114390 and 114395 authorizes the health department, as the enforcement agency, to charge fees and take extra measures to assure compliance of the law.

Orange County's health department may use the power of enforcement to improve the condition of food facilities and/or the practices of the food operators through a Notice of Violation (NOV) letter. This process consists of presenting the owner or respresentative with a specific report that includes a list of descriptions and corrections of violations that must be remediated before the follow-up visit by the EHS. Any remaining violation(s) from the NOV letter observed at the follow-up visit may result in the closure of the facility, and it may remain closed until there are no issues to resolve. Whether or not the violations are corrected, a monetary fee is associated with the issuance of a NOV (County of Orange, 2007; California Health and Safety Code, 2007). The fee for 2009 due to receiving a NOV is $308.00 for all types of facilities and situations (Snitowsky, H., personal communication, April 2, 2009). Cal Code Article 3, Sections 114405 to 114413, authorizes the entire NOV issuance process.

In the event that the violations continue to persist a Notice of Decision (NOD) letter may be issued, which is authorized in the same sections of Cal Code as the NOV letter. The NOD letter is a written contract that the facililty PIC must abide by in order to prevent the permit from being revoked. A hearing, where the PIC is given the opportunity to show cause why the permit should not be revoked is also part of a NOD issuance.

Many facilities will make permanent positive changes and begin paying closer attention to the CDC Public Health Risk Factors as determined by subsequent visits by the health department. However, there are facilities that do not show any signs of improvement, even after a closure of the facility has taken place or a fee has been issued. One step that FPP has implemented is a formal two-hour classroom-based course that may be tailored to an individual restaurant and is designed to target high risk activities. It is an educative approach to aid in correcting important compliance issues.

FEEST

In July of 2007, Orange County began offering a class to food facility employees and managers aimed at reducing risk factors associated with food-borne illness. Although a majority of the classes are mandatory due to noncompliance after several inspections or after a noncompliance that resulted in an NOV, the class is also offered on a voluntary basis for restaurant owners who want a training or refresher course for their employees. The 2-hour course is both structured and interactive. It is presented as a power point presentation and focuses on the CDC's 5 risk factors. There are two parts to the FEEST presentation; food safety and sanitation, and vermin. It can be tailored to specific facilities by focusing on different parts of the presentation.

Chapter III: Methodology

This study was set out to investigate an educational intervention for restaurant employees that is used to reduce the number of food violations in Orange County, California; therefore, a quantitative approach was deemed more appropriate for this investigation. This method is a way of collecting data concerned with describing meaning, rather than with drawing statistical inferences (Smith, 1983).

Methods

A log of restaurants that have participated in the FEEST program as well as files with pre- and post-test scores for each participant that attended were provided by the instructor. The information obtained from the attendance log included the names of the restaurants, and whether their participation in FEEST was mandatory due to a NOV or voluntary. The restaurants chosen for this study took the FEEST course between mid July of 2007 and mid July of 2008. One year of data, beginning July of 2007, was obtained for the total of 34 restaurants that were included in this study. Only one year of data was used in this report because inspections usually fall 4 to 6 months apart. Therefore, restaurants that participated in FEEST on July of 2007 would most likely have their first inspection four to six months later, between November 2007 and January 2008, their second inspection between March 2008 and July 2008, and their third re-inspection between July 2008 and January 2009. The analysis of the inspections occurred in January of 2009, therefore, up to 3 inspection reports could possibly be available for restaurants that participated in the FEEST program in the inaugural month, July 2007, but less likely as the date of class participation progressed. Given the wide range of possible inspection dates, most of the restaurants that were included in this study had only one report or one inspection after the

intervention, several had 2 reports, and only a few had 3 reports. See Appendix A, at the end of this report, for the list of restaurants and relevant information.

Not long after the restaurant participants arrive at the Environmental Health office, a brief introduction is provided along with a pre-test containing general food safety and sanitation questions. The pre- and post- tests were identical and are included in Appendix B at the end of this report. The students are explained that it is a multiple choice test, they have up to 30 minutes and the purpose of the exam; to evaluate the program. The class is interactive, meaning participants are invited to give feedback, make comments, or ask questions at any time. The post-test is given at the end of the approximately 2-hour power point presentation.

The County of Orange maintains the paper pre- and post-tests as well as Microsoft Excel files with pre and post-test scores that are assigned by the instructor. Each Excel file is named after the restaurant and contains each student's name next to their pre- and post-test score. The names of the participants are irrelevant and therefore, were permanently deleted at the beginning of this study. The average test scores were calculated for 25 of the 34 facilities, which had available scores. There were a total of 9 facilities for which no information on pre- and post-test scores were available (See Appendix A). For the purposes of this study, the student's scores were averaged and treated as a single entity, since inspections and reports do not evaluate each individual rather the facility as a whole. After an inspection by an EHS, the restaurants are given a single report based on overall sanitization and food practices observed on a particular audit. The inspection report outcomes for the restaurants before and after participation in the FEEST program were found online at the Orange County Food Protection Program website, www.ocfoodinfo.com. The log sheet included the day of the class in order to determine which

inspections occurred before and which occurred after the participation in the intervention program.

An excel sheet was created with the following information (See appendix A):

1) Restaurant name
2) Pre-test score (average)
3) Post-test score (average)
4) Inspection results of 3 inspections before the intervention
5) Inspection results of 2 inspections before the intervention
6) Inspection results of the inspections immediately before the intervention
7) Inspection results of the inspection immediately after the intervention
8) Inspection results of the 2nd inspection after the intervention
9) Inspection results of the 3rd inspection after the intervention
10) Inspection results of the 4th inspection after the intervention

The restaurant name was essential to keep track of the data and later changed to a number because the restaurant name is not necessary after the data has been gathered and tabulated. This data was transferred from excel to SPSS 16 in order to analyze the data and create tables and graphs. In this study, data from the pre- and post-test at the Orange County program will be compared and evaluated. Data from restaurant inspections before and after participation in the program will also be studied. This analysis is presented in the next chapter.

Rationale of the Methods

The study proposed in this paper was a quantitative survey study. This was utilized because the research was based on primary data collection. Basically, the quantitative approach pursues facts and is employed when researchers desire to acquire statistical truth. According to

Gall et al. (2003), quantitative research assumes that the social environment has an objective reality that is relatively constant across time and settings, while qualitative research assumes that individuals construct reality in the form of meanings and interpretations, and that these constructions tend to be transitory and situational. The methodology in the quantitative approach is to describe and explain features of the objective reality by collecting numerical data on observable behaviors of samples and by subjecting these data to statistical analysis. In this case, surveys and inspection results will be statistically analyzed in order to make assumptions and generalizations about FEEST.

The paired samples T test was used to great extent in this study. This test compares the means of two variables and tests to see if the average difference is significantly different from zero. The variables must be of the same measurement made under two different conditions. For instance, one variable used in this study was Test Score as an evaluation of the class. A pre-test and identical post-test was given to the participants. The observations are paired because it compares the same group of subjects. The null hypothesis that is used for this type of comparison is that the difference in the mean values is zero. In this case the null hypothesis would be

H_0: $d = \mu 1 - \mu 2 = 0$

The null hypothesis can be tested against one of the following alternative hypotheses, depending on what the question is:

H_1: $d = 0$

H_1: $d > 0$

H_1: $d < 0$

A general linear model (GLM) and a simple graph was also utilized for analyzing the data in this study.

Research Questions

This study will answer the following questions:

1. Do post-test results from the FEEST program demonstrate a significant improvement in food safety knowledge?
2. Do restaurants improve when comparing the inspection report immediately before to the inspection immediately after the FEEST intervention?
3. Do restaurants that have taken the class and received a NOV do better on inspection reports than restaurants that have not received a NOV but volunteered to take the class?
4. Do post-class inspections lead to an improvement in restaurant inspection reports (a reduced number of violations)?

Chapter IV: Results

Question No. 1

Do post-test results from the class demonstrate a significant improvement in food safety knowledge?

Paired-sample T-test procedures were used to test the difference between the two variables of pre- and post-test. The data consisted of two measurements taken on the same subject taken on a matched pair of subjects. Pre- and post-test results were the evaluation of the actual class/intervention. A small quiz of 25 questions was given to the participants in the beginning and at the end of the class. The data for both pre- and post-test scores was available for only 25 of the 34 restaurants that particpcated in the FEEST lecture (N=25). The paired sample T-test was carried out through SPSS 16. Table 1 shows the results of this analysis.

TABLE 1: Comparison of Pre- and Post-intervention Test Scores

		Mean	N	Std. Dev	Std. Error Mean
PAIR 1	PRE test	15.8288	25	2.02368	.40474
	POST test	20.2320	25	2.33712	.46742

Paired Samples Statistics

Table 1 displays the mean, sample size (N), standard deviation (Std Dev), and mean standard error (Std. Error Mean) for both groups. Across the respondents, the score increased from 15.82 to 20.23 on average. The standard deviations for pre- and post-test measurements reveal that there was not enough variability among participants. The standard deviation of 2.02368 indicates that most of the groups (or 68%) had an average pre-test score between 13.8051 and 17. 8525, with almost all of the groups (or 95%) scoring between 11.7814 and 19.8762 out of 25 possible point. For pre-test scores, a standard deviation of 2.33712 indicates

that most of the groups had an average test score between 17.8959 and 22.5691 with almost all of the groups scoring between 15.5588 and 24.9062 out of the 25 test questions.

Table 2: Paired Samples Correlations			
	N	Correlation	Sig.
PAIR 1 PRE test & POST test	25	0.703	0.000

Correlations show the extent to which two or more variables are related among a single group of people. The correlation coefficient is a number between +1 and -1. The number expresses the magnitude of association between pre-test and post-test scores; the closer to +1 or -1, the stronger the correlation. At 0.703, the Pearson correlation between the pre-test and post-test results was statistically significant. The positive correlation shows that as one variable increases, the other also increases. In this study participants who did well on the pre-test did similarly well on the post-test. Table 2 shows that all respondents showed significant improvement in food safety knowledge.

Table 3: Paired Samples Test								
	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-taileld)
PRE test – POST test	-4.40320	1.70636	0.34127	-5.10755	-3.69885	-12.902	24	0.000

The Mean column in the paired-samples T-test (Table 3) displays the average difference between pre- and post-test results. The Std. Deviation column displays the standard deviation of the average difference score. The Std. Error Mean column provides an index of the variability

one can expect in repeated random samples of 25 participants similar to the ones in this study. The 95% Confidence Interval of the Difference provides an estimate of the boundaries between which the true mean difference lies in 95% of all possible random samples of 25 participants similar to the ones participating in this study. The t-statistic is obtained by dividing the mean difference by its standard error. The Sig. (2-tailed) column displays the probability of obtaining a t-statistic whose absolute value is equal to or greater than the obtained t-statistic. Since the significance value for improvement in knowledge is less than 0.05, so we can conclude that post-test results from the class demonstrate a significant improvement in food safety knowledge and almost all the participants showed significant improvement in food safety knowledge.

Question No. 2

Do restaurants improve when comparing the inspection report immediately before to the inspection immediately after the FEEST intervention?

Table 4: Paired Samples Test for Major Violations Before and After the FEEST Intervention

		Paired Differences					
		Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 1	Previous Major Violations	2.93	1.79	0.33	3.9143	28	0.0005
	Post-Class Major Violations	1.55	1.55	0.29			

Table 4 (above) shows the 29 restaurants that have a pre-class and post-class inspection. The restaurants two-tailed P value equals 0.0005, which means that the difference between pre- and post- interventions are considered to be extremely statistically significant. The mean of pre-class inspection minus the mean of post-class inspections equals 1.38. The difference between violations is about 1.38 less, on average, after taking the class. The 95% confidence interval of this difference is from 0.66 to 2.10.

Table 5: Paired Samples Test for Minor Violations Before and After the FEEST Intervention

		Paired Differences					
		Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 1	Previous Minor Violations	7.21	3.06	0.57	1.3440	28	0.1897
	Post-Class Minor Violations	6.41	2.68	0.50			

Table 5 (above) demonstrates the 29 restaurants that have a pre-class and post-class inspections. The restaurants two-tailed P value equals 0.189, which is not considered to be statistically significant. . Not all restaurants showed improvement in reducing minor violations. The mean of the pre-class violations minus the post-class violations is equal to 0.79. The 95% confidence interval of this deference is from -0.42 to 2.00.

Question No. 3

Do restaurants that have taken the class and received an NOV do better on inspection reports than restaurants that have not received an NOV?

The paired-samples T-test procedures were used to test the reduction in the number of violations after the intervention class between the restaurants who received NOVs and those who did not. The data consists of two measurements taken on major and minor violations before and after the intervention. In addition, we only considered data from the inspection report that was obtained immediately before the class. This data was compared with the data obtained on the first inspection after the intervention.

Major Violations

Table 6 displays the mean, sample size, standard deviation, and standard error for both groups. According to the data, three restaurants did not receive a NOV; however, 26 restaurants did receive a NOV. In addition, it shows that restaurants who did not receive NOV increased their number of major violations after the intervention class. On the other hand, those restaurants who received a NOV showed good improvement after the intervention; their average number of major violations decreased from 3.1154 to 1.5385.

Table 6: Paired Samples Statistics

NOV			Mean	N	Std. Deviatioon	Std. Error Mean
NOV did not receive	Pair 1	Previous Major Violation	1.3333	3	1.52753	.88192
		Post Major Violation	1.6667	3	2.88675	1.66667
NOV received	Pair 1	Previous Major Violation	3.1154	26	1.75104	.34341
		Post Major Violation	1.5385	26	1.42073	.27863

At 0.945 and 0.328, the correlations between the previous major violation and post major violation are not statistically significant (Table 7). It shows that not all restaurants were successful in reducing major violations after the intervention.

Table 7: Paired Samples Correlations

NOV			N	Correlation	Sig.
NOV did not receive	Pair 1	Previous Major Violation & Post Major Violation	3	.945	.212
NOV received	Pair 1	Previous Major Violation & Post Major Violation	26	.328	.102

The Sig. (2-tailed) (Table 8) column displays the probability of obtaining a t-statistic whose absolute value is equal to or greater than the obtained t statistic. As noted earlier, restaurants who received a NOV showed good performance in reducing major violations after the intervention than restaurants who did not receive a NOV. This suspicion can be confirmed by the results of the paired-sample T-test. Since the significance value (NOV Received) is less than 0.05, we can conclude that restaurants who received a NOV do better on inspection reports than restaurants that have not receive a NOV.

Table 8: Paired Samples Test(a)

NOV			Paired Differences					
			Mean	Std. Deviation	Std. Error Mean	T	df	Sig. (2-tailed)
NOV not received	Pair 1	Prev. Major Violation – Post Major Violation	-.33333	1.52753	0.88192	-0.378	2	0.742
NOV received	Pair 1	Prev. Major Violation – Post Major Violation	1.57692	1.85845	0.36447	4.327	2	.000

Minor Violations

Table 9 displays the mean, sample size, standard deviation, and standard error for both groups. Data has revealed that average minor violations have increased from 4.33 to 5.33 in those restaurants who did not receive a NOV. While, average minor violations decreased from 7.53 to 6.53 in those restaurants who received a NOV after the intervention class.

Table 9: Paired Samples Statistics

NOV			Mean	N	Std. Deviation	Std. Error Mean
NOV did not receive	Pair 1	Previous Minor Violation	4.3333	3	1.52753	.88192
		Post Minor Violation	5.3333	3	1.15470	.66667
NOV received	Pair 1	Previous Minor Violation	7.5385	26	3.03619	.59545
		Post Minor Violation	6.5385	26	2.78899	.54697

At -0.945 (Table 10), the correlation between the previous minor violation and post minor violation are not statistically significant among restaurants who did not receive a NOV. Although, at 0.394, the Pearson correlation between the previous minor violation and post minor violation was statistically significant. It shows that all restaurants who received a NOV showed significant improvement on inspection reports.

Table 10: Paired Samples Correlations

NOV			N	Correlation	Sig.
NOV not received	Pair 1	Previoous Minor Violatioons & Post Minor Violatons	3	-.945	.212
NOV received	Pair 1	Previous Minor Violations & Post Minor Violations	26	.394	.046

The Sig. (2-tailed) (Table 11) column displays the probability of obtaining a t-statistic whose absolute value is equal to or greater than the obtained t-statistic. We noted earlier that

restaurants who received a NOV do better on inspection reports after the intervention than restaurants who did not receive a NOV. However, significance values of 0.580 and 0.125 are greater than 0.05, which indicates that the differences are not significant for the two categories of restaurants. Therefore, we can conclude that restaurants who received a NOV show better performance, on average, than restaurants who did not receive a NOV. However, this result was not statistically significant.

Table 11: Paired Samples Test(a)

NOV			Paired Differences					
			Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
NOV not received	Pair 1	Previous Minor Violation – Post Minor Violation	-1.00000	2.64575	1.52753	-0.655	2	0.580
NOV received	Pair 1	Previous Minor Violation – Post Minor Violation	1.00000	3.21248	0.63002	1.587	25	0.125

Question Number 4

Do post-class inspections show a significant improvement in the number of violations?

To find out the effects of post class inspections, a General Linear Model (GLM) univariate procedure was carried out through SPSS 16. The GLM Univariate procedure is based on the GLM procedure, in which factors and covariates are assumed to have a linear relationship to the dependent variable. For this analysis, categorical predictors, that is, inspections and type of violations were used as factors in the model because each level of a factor can have a different linear effect on dependent variables.

Table 12: Tests of Between-Subjects Effects					
Dependent Variable: Number of violations					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	712.037[a]	7	101.720	16.668	.000
Intercept	830.388	1	830.388	136.070	.000
Post class Inspection * Number of violations	9.005	3	3.002	.492	.689
Error	634.677	104	6.103		
Total	3236.000	112			
Corrected Total	1346.714	111			
a. R Squared = .529 (Adjusted R Squared = .497)					

Table 12 is an analysis of variance table. Each term in the model, plus the model as a whole, is tested for its ability to account for variation in the dependent variable. The significance value for inspection is greater than 0.05, which shows that post-class inspections were not helpful in reducing the number of violations.

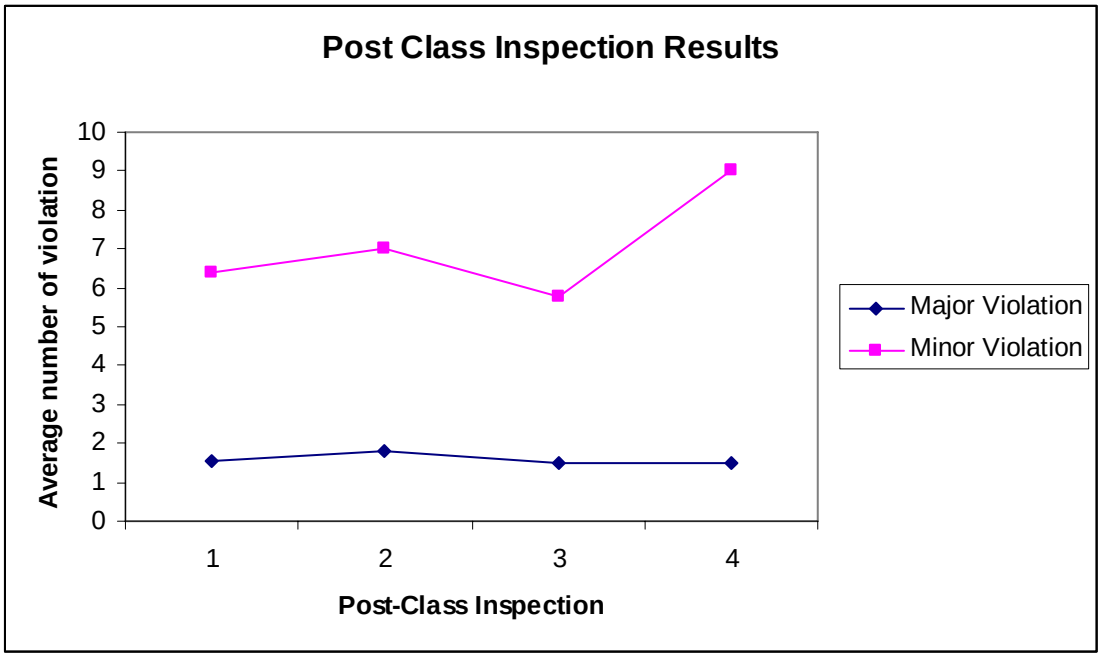

Figure 1. Post-class inspections against average number of violations.

Figure 1 is a visual represention of post-class inspection results. The factor levels of inspections are shown along the horizontal axis. Separate lines are produced for average major and minor violations. Alternately, the average number of faults could be shown along the horizontal axis. Figure 1 depicts that post class inspections were not helpful in minimizing the number of faults. There is a slight decrease in the average number of major violations but this difference is not significant. The results from the post-class inpection revealed that minor violation has increased sharply; therefore, we can conclude that post-class inspections were not helpful in reducing the number of violations.

Chapter V: Discussion and Conclusion

This study was set out to assess FEEST, an educational intervention for restaurant employees used to reduce the number of food violations observed during routine inspections in Orange County, California. Post-test results from the class demonstrate a significant improvement in food safety knowledge. Therefore, this educational intervention was very helpful in enhancing the food safety knowledge of the food facility employees. Restaurants initially showed a significant improvement in reducing the number of major violations however, the slight improvement in minor violations was not significant. Moreover, results also showed that restaurants who received a NOV do better on inspection reports in reducing major violations than those who did not receive a NOV, but both type of restaurants were not able to significantly reduce minor violations. Further results showed that, overall, post-class inspections were not helpful in reducing the number of violations following the intervention.

The pre- and post- test were identical and included broad topics that food workers should be familiar with. The improvement in test score was significant and shows that the class was effective in conveying to the participants crucial key factors of food safety and sanitation. However, food workers did not appear to use this acquired knowledge after the FEEST intervention, as seen by post-class restaurant inspection reports. In other words, the post-tests showed increased knowlegde but the post-inspections showed no or only slight improvement in safe food practices. This may imply that the information provided during the FEEST program is not being applied for reasons other than lack of knowledge. According to Seaman and Eves (2006), a common misguided assumption is that knowledge alone will lead to changes in attitudes and thus behavior.

Another outcome observed in this study was that routine inspections did not impact the number of violations observed at the facilities that participated in this study, as illustrated in Figure 1. Instead, inspection reports indicate practically no change in the rate of major violations, and an increase in minor violation. The chart illustrates that minor and major violations are stable or decrease initally, but by the 4th inspection the number of minor violations significantly increases. It could be an effect of the emphasizing of major violations during in the FEEST class. Also, minor violations may not be seen by food workers a priority or as posing a risk to the public. Turnaround is common in the food business so new employees without proper training can cause a facility to do poorly on inspection.

In a similar study, Newbold et al. (2008) investigated the association between restaurant inspection frequency and food safety compliance. The study, which used restaurants from Hamilton, Ontario, Canada, expected to see greater compliance rates with an increase in inspection frequency. Restaurants under Hamilton Public Health jurisdiction are separated into the following three categories 1) High risk premises that serve perishable foods requiring multiple preparation steps and are inspected three times a year; 2) Medium risk premises that serve perishable foods requiring minimal preparation steps and are inspected twice a year; 3) Low risk premises that serve prepackaged food and are inspected once a year. In this study, only high risk facilities were used and randomly assigned inspection frequency rates of three, four, or five times during the year 2006. Newbold et al. (2008) demonstrated that, with the exception of a 50% drop in critical infraction rates, compliance ratios did not vary in 2006 to those of the previous two years. The results also showed that the critical infraction rates actually increased from 0.16 for three times a year inspections, 0.19 for four times a year inspections, and 0.21 for 5 times a year inspections, although these findings were not statistically different. The Hamilton

investigation concluded that the frequency of inspection rates does not impact food handling performance (Newbold et al., 2008).

There are several simple strategies that can be put into place in order to facilitate safer food handling skills such as those mentioned in the FEEST intervention.. The class goes over general food safety and sanitation and a copy of the power point presentation slides are given to each participant for reference at their worksites. However, a more user-friendly guide with key points and small enough that workers can keep on-hand may be more useful for a restaurant business. Tools such as magnets illustrating proper holding temperatures or laminated posters illustrating processes for thawing or cooling may also be useful in a kitchen setting. The managers may find a checklist of violations useful to self-inspect their own facility. It may also be useful to follow-up with the restaurant managers to see whether or not the newly acquired knowlegde is being implemented, such as having set appointment times to talk about any questions that may have come up after the FEEST program. The following studies support the bottom line; interventions should target managers who must step up to the plate and take responsibility of assuring that their employees are supportive of safe food handling practices and a sanitary environment.

Cotterchio (1998) led a study investigating the effect of a manager training program on sanitary conditions of restaurants. A total of 94 managers participated of which 23 were required to attend, 21 attended voluntarily and 40 served as controls. In this study, the overall average baseline inspection scores were 73, increased to 81 after one year, and improved to 84 at the two-year follow-up. For the control group, the mean scores at baseline one-year post intervention and two-years post intervention were 77, 80 and 83, respectively. For the voluntary group, the baseline, one-year post, and two-years post intervention levels were 74, 81, and 84, respectively.

The mandatory group had a basline level of 66, which increased to 81 and then 83 at the one-year and two-year mark, respectively. At the beginning of the study, the baseline score for the mandatory group was noticeably lower than for the other groups. The mandatory group did improve the most, with an increase of 17 points total, compared to the improvement in the voluntary (10) and control (6) groups. In short, manager training did improve the sanitary conditions of the restaurants.

Several studies support and highlight the need for proper training of restaurant employees, and the need of restaurant managers to take food safety seriously. Hine et al., surveyed 140 managers regarding their attitude towards food safety training About 72% of the managers responded that they were likely to hire previously trained workers, 54% stated that they would hire a trained worker at a higher level, 39% stated that they would pay a higher base salary to a trained worker. Overall, the findings demonstrated that managers highly value food safety training although already hired employees that do not have adequate training may not agree. Only 20% of the managers responded that they would give a pay raise or promote a worker that has attended a training.

There are other ways that a manager can assure their staff have the proper training. Lee Biars (2008), Director of Industry Relations for Safe Food Solutions, stated that employees may walk away from a food service job with no change in their food handling and hygiene practices for lack of interest. The solution is for management to make the food service employee care.

Biars explains that the key components to a successful training program can be applied to any training and not only foodservice. The following is a list of what works:

1. **Getting them involved** - by building a culture that emphases the importance of safe food handling and proper hygiene, touching on food safety related topics at every meeting, and correlating food safety with financial success.
2. **Training all staff (front and back of the house)** - Provide training to all staff, not only supervisors or managers who do not always communicate food safety knowledge to line staff.
3. **Keeping an eye on the headlines** - Keep the staff up to date with current restaurant closures due to foodborne illness incidents.
4. **Pop quizzes** - Surprise the staff with food safety quizzes rewarded by recognition or compensation for those that score high.
5. **Making an example out of someone**: Carry out consequences when employees repeatedly make the same serious mistakes. This tactic should be used with caution because, although this shows how serious food safety is, it can also hurt morale.

Conversely, the following is a list of what does not work:

1. **Posters** - Passive way of training. Positive changes do not result without offering reasons for the behavior expected.
2. **Videos and DVDs** - One-sided trainings are typically not as engaging as a training that involves the students and requires participation.
3. **Textbooks/Workbooks** – Food safety may not be an interesting topic to read about for food service workers, especially if the employee does establish the benefit or importance of the text.

Classroom settings can either work or not work depending on the mood and skill of the instructor. A strong instructor teaching a course or seminar can be even more beneficial if the course or seminar is repeated and given to all of the employees (Biars, 2008).

Shea (2005) reports that Jack in the Box mangers take the opportunity to update food-safety training every time a new item is launched. Dave Theno, senior Vice President of Quality and Logistics for Jack in the Box stated that weekly updates to the menu provides training opportunities of new food safety techniques for employees. When a new chicken sandwich was launched, a new mixture was involved. The new procedure for making the mixture was introduced with demonstrations of the correct preparation process. During this demonstration, food handling and storage techniques were reviewed. Theno believes that proper food safety education by management can result in the understanding of the consequences to negative practices that gives workers a greater appreciation of for the customers well-being (Shea, 2005).

Further analysis of the effects of FEEST on restaurant inspections should be calculated using recently gathered data in order to create a larger study population with a more complete data sets. The Orange County FEEST program is an important resource for restaurants that are struggling to maintain their facilites up to required standards. Health department trainings, like FEEST, have usually been most effective in delivering food safety education (Lynch et al., 2003). This study concludes FEEST and future trainings should focus on empowering managers so that they can become everyday health inspectors at their facilities.

Works Cited

Allwood, P.B., Jenkins, T., Paulus, C., Johnson, L., Hedberg, C.W. (2004). Hand washing compliance among retail food establishment workers in Minnesota. *Journal of Food Protection, 67*, 2825-8.

Bertagnoli, L. (1996). After the outbreak: Jack in the Box's quick response to disaster has turned into a crusade for food safety. *Restaurants & Institutions*..

Biars, L. (2008). What Works. *Food & Drink*, *7*(2), r2008,-r20013.

Buchholz, U., Run, G., Kool, J.L., Fielding, J., Mascola, L. (2002). A risk-based restaurant inspection system in Los Angeles county. *Journal of Food Protection, 65*(2), 367-72.

Buzby, J.C., Frenzen, P.D., Rasco, B. (2001). Product liability and microbial foodborne illness. *Agricultural Economic Report, 799*, 45-88.

California Retail Food Safety Coaliton CRFSC. (2007). *California Retail Food Code - Summary of Major Changes.* Retrieved Feb. 2, 2009, from http://www.crfsc.org/calcode/calcode_summary.pdf.

California. Health and Safety Code. Retail Food Code. (2007).

Carlson, A., Kinsey, J., Nadav, C. (2002). Consumers' retail source of food: a cluster analysis. *Family Economics and Nutrition Review, 14*(2), 11-20,

CDC. (2006). *Multistate Outbreak of E. coli O157 Infections, November-December 2006.* Retrieved Feb. 25, 2009, from http://www.cdc.gov/ecoli/2006/december/121406.htm

CDC. (2007). Norovirus outbreak associated with ill food-service workers --- Michigan, January--February 2006. *Morbidity and Mortality Weekly Report (MMWR)*, *56*(46), 1212-1216.

Cotterchio, M., Gunn, J., Coffill, T., Tormey, P., Barry, M.A. (1998). Effect of a manager training program on sanitary conditions in restaurants. *Public Health Reports, 113*, 353-8.

County of Orange. (2009). Weekly Update of Fixed-site Food Facilities Regulated by OC Environmental Health (rev. 3/25/09). Retrieved April 1, 2009, from HCA Food Protection Program Web site: http://www.ochealthinfo.com/docs/regulatory/eh/food_facilities.xls.

Crutchfield, S. R. & Roberts, T. (2000). Food safety efforts accelerate in the 1990's. *Food Review*, *23*(3), 44-49.

Davis, G. (2001). *Food Safety Notice.* Retrieved Jan. 25, 2009, from http://www.dhs.ca.gov/fdb/local/PDF/fsn01-01.pdf

Environmental Health-Net. (2004). *Journal of Environmental Health*, *67*(2), 43.

Gall, M. D., Gall, J. P., Borg, W. R. (2003). Educational Research: An Introduction (7th ed.). Boston: Allyn & Bacon.

Golan, E., Roberts, T., Salay, E., Caswell, J., Ollinger, M., Moore, D. (2004). Food safety innovation in the United States: evidence from the meat industry. *Agricultural Economic Report Number, 831*, 88-215.

Green, L.R., Selman , C.A., Radke, V., Ripley, D., Mack, J.C., Reimann, D.W., et al. (2006). Food worker hand washing practices: An observational study. *Journal of Food Protection*, *69*(10), 2417-2423.

Green, L.R., Selman, C., Scallan, E., Jones, T.F., Marcus, R. (2005). (The) EHS-Net Population Survey Working Group: Beliefs about meals eaten outside the home as sources of gastrointestinal illness. *Journal of Food Protection, 68*(10), 2184-9.

Henkel, J. (1999). Juice Maker Fined Record Amount for E. Coli-tainted Product. *FDA Consumer*, *33*(1), 34-35.

Hine, S., Thilmany, D., Kendall, P., Smith, K. (2003) Is training important to food service managers? *Extension Journal*, RB1.

Knight, A.J., Worosz, M.R., Todd, E.C.D. (2007). Serving food safety: Consumer perceptions of food safety at restaurants. *International Journal of Contemporary Hospitality Management, 19*(6), 476-484.

Jones, T.F. & Angulo, F.J. (2006). Eating in restaurants: A risk factor for foodborne disease? *Clinical Infectious Diseases, 42*, 1324-8.

Jones, T.F. & Grimm, M.A. (2008). Public knowledge and attitues regarding public health inspections of restaurants. *The American Journal of Preventive Medicine, 34*(6).

Lee, J., Almanza, B., Nelson, D., & Ghiselli, F. (2009). Using health inspection scores to assess risk in food services. *Journal of Environmental Health*, *71*(7), 29-33.

Lynch, R.A., Elledge, B.L., Griffith, C.C., Boatright, D.T. (2003). A comparison of food safety knowledge among restaurant managers, by source of training and experience, in Oklahoma County, Oklahoma. *Journal of Environmental Health, 66*(2), 9-14.

Marler, C. (2009). Thousands at risk of Hepatitis A. Retrieved February 20, 2009, from http://www.clarkmarler.com

Mathias, R.G., Riben, P.D., Campbell, E., Wiens, M., Cocksedge, W., et al. (1994). The evaluation of the effectiveness of routine restaurant inspections and education of food handlers: Restaurant inspection survey. *Canadian Journal of Public Health, 85*(1), 56-60.

Morrison, P., Caffin, N., Wallace, R. (1998). Small establishments present challenge for Australian food safety code. *International Journal of Contemporary Hospitality Management, 10*(3) 101-106.

Newbold, B.K., McKeary, M., Hart, R., Hall, R. (2008). Restaurant inspection frequency and food safety compliance. *Journal of Environmental Health, 71*(4), 56-61.

National Restaurant Association (2005). Health & Safety Backgrounder. *FDA Model Food Code.* Retrieved February 09, 2009 from http://www.restaurant.org/healthsafety/foodcode.cfm

Orange County, Health Care Agency. (2007). *Standard Operating Procedures* (2nd ed.) [Brochure]. Santa Ana, CA: Environmental Health.

Orange County Health Care Agency (OCHCA): Environmental Health Services. Date not provided. *Food Protection Program Public Notification Consumer Information* [Brochure]. Santa Ana, California.

Orange County Health Care Agency: Food Protection Program (2006). *Duties of an Environmental Health Specialist I in the Food Protection Program.* Santa Ana, California.

Seaman, P. & Eves, A. (2006). The management of food safety-role of food hygiene training in the UK service sector. *International Journal of Hospitality Management*, *25*(2), 278-296.

Phillips, A.L. (1986). Food hygiene health education in Wyre Borough. B.Sc. Dissertation. Civil Engineering department. Univeristy of Salford.

Phillips, M., Elledge, B., Basara, H., Lynch, R., Boatright, D., et al. (2006). Recurrent critical violations of the food code in retail food service establishments. *Journal of Environmental Health*, *68*(10), 24-30.

Rennie, D.M. (1994). Evaluation of food hygiene education. *British Food Journal, 96*(11), 20-25.

Roberts, K.F.R. & Sneed, J. (2003). Status of prerequisite and HACCP program implementation in Iowa restaurants. *Food Protection Trends, 23*(10), 808-16.

Shea, E. (2005). Rollout Review. *Restaurants & Institutions*, *115*(17), 60.

Smith¸ J.K. (1983). Quantitative versus qualitative research: An attempt to clarify the issue. *Educational Researcher, 12*(3), 6-13.

Veil, S., Liu, M., Erickson, S., Sellnow, T. (2005). Too Hot to Handle: Competency Constrains Character in Chi-Chi's Green Onion Crisis. *Public Relations Quarterly*, *50*(4), 19-22.

Washington State Department of Health. (2008). *The health of Washington State, 2007: Foodborne illness outbreaks.* Retrieved Apr. 2, 2009, from http://www.doh.wa.gov/HWS/doc/EH/EH-FS2007.pdf

Wheeler, C., Vogt, T.M., Armstrong, G.L., Vaughan, G., Weltman, A., et al. (2005). An outbreak of hepatitis A associated with green onions. *New England Journal of Medicine, 353*(9), 890-7.

Worsfold, A. (1993). Food Safety: An appraisal of a training programme. *Journal of the Royal Society of Health*, *113*(6), 316-319.

World Health Organization (WHO). (2007). *Food Safety and foodborne illness.* Retrieved Mar. 14, 2009, from http://www.noaanews.noaa.gov/stories/s1119.htm

APPENDIX A

Restaurants that Participated in the FEEST Program from July 2007 to July 2008																			
				Inspections in Chronological Order – From 3 Inspections before to 4 Inspections After the Intervention															
	REST #	PRE-TEST	P0ST-TEST	Pre-Inspection 3		Pre-Inspection 2		Pre-Inspection 1			Post-Inspection 1		Post-Inspection 2		Post-Inspection 3		Post-Inspection 4	
				MAJ	MIN	MAJ	MIN	MAJ	MIN		MAJ	MIN	MAJ	MIN	MAJ	MIN	MAJ	MIN
NOV ISSUED / MANDATORY CLASS	1*							2	7		0	4	1	5	0	9		
	2*			1	8	1	9	5	5		0	1	0	8	0	6		
	3*					1	3	6	8		2	6	5	7				
	4*					1	3	6	8		2	6	5	7				
	5	16.6	22.1					6	1		2	7	1	7	1	4		
	6	15.5	19.6			3	7	4	12		1	7	0	5	2	6		
	7	15.8	19.6			7	11	4	13		4	11	3	14				
	8	18	22					1	7		3	6	2	9	4	11	3	16
	9	11.5	19			1	7	5	6		3	5	1	6				
	10	11.67	15.33			0	9	0	10		0	7	0	7				
	11	16.4	23.4	3	5	3	6	6	5		3	4	3	8	5	6		
	12	16.6	21	3	13	2	8	3	6		0	12						
	13	20	25			4	10	3	6		0	7	4	6				
	14	16.5	19			4	5	2	7		2	8						
	15	16.67	18.33	4	0	3	8	3	8		4	8	4	3				
	16	18.71	23.71	3	7	2	5	2	6		0	5						
	17	13.6	18.9	3	13	4	6	2	14		2	13						
	18	16	21.75			2	1	2	5		2	5	1	7	0	2	0	2
	19	17.44	20.44	3	6	3	6	1	5		0	3	0	3				
	20	15.5	21	1	5	3	8	2	5		3	7						
	21	15	18	5	7	5	11	1	8		1	6	1	11				
	22	16.8	20.4	4	13	2	8	2	9		0	4						
	23	14.3	23	3	10	4	8	4	8		1	4						
	24	17.29	19.71	1	3	3	6	4	6		4	7						
	25	17.3	22	2	9	2	11	2	14		1	6						
	26	15.6	17.4	5	11	2	11	3	7		0	11						
	27 **	15.14	18.43	6	12	2	11	4	10									
	28 ***																	
	29 ***																	
NO NOV	30 ***																	
	31*					1	9	1	6		0	4	0	6	0	2		
	32	15.5	20.4	0	6	2	6	0	3		0	6						
	33	12.3	16.3	7	8	3	10	3	4		5	6						
	34 ***										0	4	1	5	0	9		

INTERVENTION

REST	Numbered restaurants that participated in the FEEST program	Pre-Inspection 3, 2 & 1	Inspections leading to the intervention
PRE-TEST	Test score average before the intervention	Post-Inspection 1, 2 & 3	Inspections after the intervention
POST-TEST	Test score average after the intervention	MAJ	# of Major violations observed
*	Not included in PRE- and Post-TEST analysis	MIN	# of Minor violations observed
**	Not included in Change in Violations analysis		Information not available
***	Not included in the study		

APPENDIX B

Orange County Environmental Health
Food Protection Program

Food Employee Education & Sanitation Training (FEEST)

Basic Food Safety and Sanitation Pre / Post Test

Name:_____ **Date:**_____

Facility Name:_____

Instructions:

You will have 30 minutes to complete the exam. Read each question completely and select the best answer from the available choices. Mark your answer to each question by circling the letter (a, b, c, d, or e) that is next to the answer you selected. Mark one answer per question and one answer only. If you are having difficulty with a particular question, skip the question and move on, then go back to it once you have reached the end of the exam. If you are still unsure of the correct answer, make your best guess and move on to the next question. If you do not understand a question, raise your hand and someone will come over and help you.

1) **Good food safety practices are essential to the success of a retail food business.**

   a) Agree
   b) No Opinion
   c) Disagree

2) **The way you handle food can make a person sick.**

   a) Agree
   b) No Opinion
   c) Disagree

3) **A foodborne disease is relatively harmless with mild symptoms.**

   a) Agree
   b) No Opinion
   c) Disagree

4) **A rat or cockroach in a kitchen can make someone sick.**

   a) Agree

b) No Opinion
c) Disagree

5) Food prepared in a dirty kitchen can make someone sick.

a) Agree
b) No Opinion
c) Disagree

6) The temperature a food is kept at can make someone sick.

a) Agree
b) No Opinion
c) Disagree

7) A sick employee can give that illness to a customer.

a) Agree
b) No Opinion
c) Disagree

8) What is the minimum sanitizer concentration when using chlorine (bleach) to sanitize utensils in a 3-compartment sink?

a) 50 ppm
b) 100 ppm
c) 200 ppm
d) 400 ppm

9) What is the minimum temperature for keeping hot foods hot?

a) 100°F
b) 120°F
c) 135°F
d) 165°F

10) Storing raw chicken above a salad in a refrigerator can lead to a foodborne disease.

a) Agree
b) No Opinion
c) Disagree

11) When is it safe and legal to sell food to the public from a private home?

a) Always
b) Weekends only

c) Only on special occasions
d) Never

12) What should a food facility operator do when an employee comes to work sick with diarrhea?

a) Fire the employee
b) Send the employee home
c) Nothing, they are okay to work
d) Have them wash dishes only

13) After doing which of these things should a food worker wash their hands?

a) Handling raw meat
b) Using the restroom
c) Scratching their face, head, or body
d) All of the above

14) What is the minimum cooking temperature for raw chicken?

a) 135°F
b) 165°F
c) 185°F
d) 212°F

15) What is the maximum temperature for the cold holding of perishable foods?

a) 32°F
b) 41°F
c) 45°F
d) 50°F

16) Which of these practices would be an approved rapid cooling method for soup?

a) Cool at room temperature in the pot on the prep table
b) Cool in a big plastic bucket with a lid in the walk-in cooler
c) Store the pot in the walk-in cooler immediately after cooking
d) Place the pot into an ice bath immediately after cooking and stir frequently

17) Which is the proper order for cleaning utensils?

a) Wash, sanitize, then rinse.
b) Rinse, wash, then sanitize.
c) Wash, rinse, then sanitize.
d) Sanitize, wash, then rinse.

18) Which of the following is an example of cross-contamination?

a) Cutting cooked chicken and then cutting lettuce on the same cutting board.
b) Cutting cooked fish and then cutting raw chicken on the same cutting board.
c) Cutting vegetables and then cutting bread on the same cutting board.
d) Cutting raw chicken and then cutting a sandwich on the same cutting board.

19) What is the minimum hot water temperature required throughout a food facility?

a) 100°F
b) 110°F
c) 120°F
d) 130°F

20) There are precautions you can take to help prevent your customers from getting a foodborne disease.

a) Agree
b) No Opinion
c) Disagree

21) There are obstacles that prevent you from practicing safe food handling.

a) Agree
b) No Opinion
c) Disagree

22) What is the minimum length of time that a food worker should take when washing their hands?

a) Less than 5 seconds
b) 5 to 10 seconds
c) 10 to 15 seconds
d) 15 to 20 seconds

23) What is the maximum time permitted to reheat perishable foods to 165°F?

a) 90 minutes
b) 120 minutes
c) 150 minutes
d) 180 minutes

24) Which of these is *not* a CDC risk factor for foodborne disease?

a) Improper labeling
b) Poor Employee hygiene
c) Dirty or Contaminated equipment
d) Improper holding temperature

25) Which of these diseases does the person in charge (PIC) *not* have to report to the local enforcement agency if an employee has it?

a) *E. coli* O157:H7
b) Botulism
c) Salmonella
d) Norovirus